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OF

ARTS and SCIENCES,

COMPILED UPON A NEW PLAN.

IN WHICH

The different SCIENCES and ARTS are digeſted into diſtinct Treatiſes or Syſtems;

AND

The various TECHNICAL TERMS, &c. are explained as they occur in the order of the Alphabet.

ILLUSTRATED WITH ONE HUNDRED AND SIXTY COPPERPLATES.

By a SOCIETY *of* GENTLEMEN *in* SCOTLAND.

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Encyclopædia Britannica;

OR, A NEW

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MACAO, an iſland of China, in the province of Canton, fifty miles ſouth of Canton.

MACAO, in ornithology. See PSITTACUS.

MACCABEES, two apocryphal books of ſcripture; ſo called from Judas Mattathias, ſurnamed Maccabeus. The firſt book of the Maccabees is an excellent hiſtory, and comes neareſt to the ſtyle and manner of the ſacred hiſtorians of any extant. It contains the hiſtory of forty years, from the reign of Antiochus Epiphanes to the death of Simon the high prieſt; that is, from the year of the world 3829 to the year 3869, 131 before Chriſt. The ſecond book of the Maccabees begins with two epiſtles ſent from the Jews of Jeruſalem to the Jews of Egypt and Alexandria, to exhort them to obſerve the feaſt of the dedication of the new altar erected by Judas on his purifying the temple. After theſe epiſtles follows the preface of the author to his hiſtory, which is an abridgment of a larger work, compoſed by one Jaſon, a Jew of Cyrene, who wrote the hiſtory of Judas Maccabeus and his brethren, and the wars againſt Antiochus Epiphanes and Eupator his ſon. This ſecond book does not, by any means, equal the accuracy and excellency of the firſt. It contains a hiſtory of about fifteen years, from the execution of Heliodorus's commiſſion, who was ſent by Seleucus to fetch away the treaſures of the temple, to the victory obtained by Judas Maccabeus over Nicanor; that is, from the year of the world 3828, to the year 3843, 147 years before Chriſt.

MACCLESFIELD, a market-town of Cheſhire, thirty-five miles eaſt of Cheſter, from whence the noble family of Parker take the title of earl.

MACE, the ſecond coat or covering of the kernel of the nutmeg, is a thin and membranaceous ſubſtance, of an oleaginous nature and a yellowiſh colour; being met with in flakes of an inch and more in length, which are divided into a multitude of ramifications. It is of an extremely fragrant, aromatic and agreeable flavour, and of a pleaſant, but acrid and oleaginous taſte.

Mace is carminative, ſtomachic, and aſtringent; and poſſeſſes all the virtues of nutmeg, but is leſs aſtringent.

MACEDONIA, a province of European Turky, bounded by Servia and Romania, on the north and eaſt; by the gulphs of Salonichi, Conteſſa and Theſſaly, on the ſouth; and by Albania and Epirus, on the weſt.

MACERATION, is an infuſion of, or ſoaking ingredients in water or any other fluid, in order either to ſoften them, or draw out their virtues.

MACHIAN, a ſmall iſland of the Moluccas, which produces the beſt cloves: it is ſituated under the equator, in 125° E. long. and is ſubject to the Dutch.

MACHINE, in general, whatever hath force ſufficient to raiſe or ſtop the motion of a heavy body. See MECHANICS.

MACHINERY, in epic and dramatic poetry, is when the poet introduces the uſe of machines, or brings ſome ſupernatural being upon the ſtage, in order to ſolve ſome difficulty, or to perform ſome exploit out of the reach of human power. See COMPOSITION.

MACKERAN, or MACKAN, the capital of a province in Perſia of the ſame name; ſituated in E. long. 66°, and N. lat. 26°.

MACKEREL, in ichthyology. See SCOMBER.

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MACROCERCI, a name given to that claſs of animalcules, with tails longer than their bodies.

MACROPYRENIUM, in natural hiſtory, a genus of foſſils, conſiſting of cruſtated ſeptariæ, with a long nucleus ſtanding out at each end of the maſs.

MACROTELOSTYLA, in natural hiſtory, a name of a genus of cryſtals, which are compoſed of two pyramids, joined to the end of a column; both the pyramids, as alſo the column, being hexangular, and the whole body conſequently compoſed of eighteen planes.

MACULÆ, in aſtronomy, dark ſpots appearing on the luminous faces of the ſun, moon, and even ſome of the planets. See ASTRONOMY.

These ſpots are moſt numerous and eaſily obſerved in the ſun. It is not uncommon to ſee them in various forms, magnitudes, and numbers, moving over the ſun's diſk. They were firſt of all diſcovered by the lyncean aſtronomer Galileo, in the year 1610, ſoon after he had finiſhed his new-invented teleſcope.

MAD APPLE. See SOLANUM.

MADAGASCAR, or *St* LAURENCE, an iſland of Africa, ſituated between 43° and 51° of eaſt longitude, and between 12° and 26° ſouth latitude; three hundred miles ſouth-eaſt of the continent of Africa. It is about a thouſand miles in length from north to ſouth, and generally between two and three hundred miles broad. The country is divided among a great number of petty ſovereigns.

MADDER. See RUBIA.

MADERAS, ſome iſlands ſituated in the Atlantic ocean, three hundred miles weſt of Sallee, in Africa; in 16° W. long. and between 32° and 33° of N. lat.

The largeſt of them, called Madera, or rather Mattera, by the Portugueſe, is about an hundred and twenty miles in circumference, and produces incredible quantities of wine, which has the peculiar quality of keeping beſt in hot climates, where other wines turn ſour.

MADNESS, a moſt dreadful kind of delirium, without a fever. See MEDICINE.

MADRAS, a town on the coaſt of Cormandel, inhabited by blacks, and ſituated juſt without the walls of the White town of Fort St George.

MADRE DE POPA, a town and convent of Terra Firma, in South America, ſituated on the river Grande, fifty miles eaſt of Carthagena, almoſt as much reſorted to by the pilgrims of America, as the chapel of Loretto is by the pilgrims of Europe: W. long. 76° N. lat. 11°.

MADRID, the capital of the province of New Caſtile, and of the whole kingdom of Spain: W. long. 4° 15′, and N. lat. 4° 30′.

MADRIGAL, is a ſhort amorous poem, compoſed of a number of free and unequal verſes, neither confined to the regularity of a ſonnet, nor to the point of an epigram, but only conſiſting of ſome tender and delicate thought, expreſſed with a beautiful, noble, and elegant ſimplicity.

MADRIGAL, in geography, a city of the province of Popayan, in ſouth America: W. long. 75° 30′, and N. lat. 30′.

MADURA, the capital of the province of the ſame name in the hither India: E. long. 77°, and N. lat. 10°.

MÆMACTERION, the fourth month of the Athenian year, conſiſting of only twenty-nine days, and anſwering to the latter part of September and the beginning of October.

MÆNA, in ichthyology. See SPARUS.

MAES, a river which ariſes in Burgundy, and runs through Lorrain and Champaign into the Netherlands, and at laſt, after paſſing by many conſiderable towns, diſcharges itſelf into the German ſea, a little below the Briel.

MAESTRICHT, a town in the provine of Brabant, ſituated on the river Maes, thirteen miles north of Liege: E. long. 5° 40′, and N. lat. 50° 55′.

MAGADOXA, the capital of the territory of the ſame name, at the mouth of the river Magadoxa, on the coaſt of Anian, in Africa: E. lon. 41°, and N. lat. 2°.

MAGAZINE, a place in which ſtores are kept, of arms, ammunition, proviſions, *&c.* Every fortified town ought to be furniſhed with a large magazine, which ſhould contain ſtores of all kinds, ſufficient to enable the garriſon and inhabitants to hold out a long ſiege, and in which ſmiths, carpenters, wheelwrights, *&c.* may be employed, in making every thing belonging to the artillery, as carriages, waggons, *&c.*

MAGDALEN, or *Nuns of St* MAGDALEN, an order of religious in the Romiſh church, dedicated to St Mary Magdalen, and ſometimes called Magdalenettes. Theſe chiefly conſiſt of courtezans, who, quitting their profeſſion, devote the reſt of their lives to repentance and mortification.

MAGDEBURG, the capital of the duchy of the ſame name, ſituated on the river Elbe, ſeventy miles weſt of Berlin: E. long. 12°, and N lat 52° 15′

MAGDELENA, a large river of South America, which, riſing near the equator, runs north through Terra Firma, and, uniting its waters with the river Cance, obtains the name of the river Grande, and falls into the north ſea, below the town of Madre de Popa.

MAGELLAN STREIGHTS, or rather *Streights of* MAGELLAN. Theſe ſtreights are about three hundred miles in length from the Atlantic to the Pacific ocean, but of a very unequal breadth; and were at firſt diſcovered and paſſed by Ferdinand Magellan, from whom they had their name; they are ſituated between the iſland Terra del Fuego and the moſt ſouthern part of the continent of America, between 76° and 84° of W. long. and between 52° and 54° of ſouth lat.

MAGI, or MAGIANS, an ancient religious ſect in Perſia and other eaſtern countries, who maintained, that there were two principles, the one the cauſe of all good, the other the cauſe of all evil; and, abominating the adoration of images, worſhipped God only by fire, which they looked upon as the brighteſt and moſt glorious ſymbol of Oromaſdes, or the good God; as darkneſs is the trueſt ſymbol of Arimanius, or the evil god. This religion was reformed by Zoroaſter, who maintained that there was one ſupreme independent being; and under him two principles or angels, one the angel of

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of goodneſs and light, and the other of evil and darkneſs: that there is a perpetual ſtruggle between them, which ſhall laſt to the end of the world; that then the angel of darkneſs and his diſciples ſhall go into a world of their own, where they ſhall be puniſhed in everlaſting darkneſs; and the angel of light and his diſciples ſhall alſo go into a world of their own, where they ſhall be rewarded in everlaſting light.

The prieſts of the magi were the moſt ſkilful mathematicians and philoſophers of the ages in which they lived, inſomuch that a learned man and a magian became equivalent terms. The vulgar looked on their knowledge as more than natural, and imagined them inſpired by ſome ſupernatural power; and hence thoſe who practiſed wicked and miſchievous arts, taking upon themſelves the name of magians, drew on it that ill ſignification which the word magician now bears among us.

This ſect ſtill ſubſiſts in Perſia, under the denomination of gaurs, where they watch the ſacred fire with the greateſt care, and never ſuffer it to be extinguiſhed.

MAGIC, originally ſignified only the knowledge of the more ſublime parts of philoſophy; but as the magi likewiſe profeſſed aſtrology, divination and ſorcery, the term magi became odious, being uſed to ſignify an unlawful diabolical kind of ſcience, acquired by the aſſiſtance of the devil and departed ſouls.

MAGIC LANTERN, in optics. See OPTICS.

MAGISTERY, in chemiſtry, a very fine powder made by ſolution and precipitation.

MAGISTERY *of Biſmuth*. See CHEMISTERY, p. 90. 142

MAGISTRATE, any public officer to whom the executive power of the law is committed, either wholly or in part.

MAGNA ASSISA ELIGENDA, is a writ anciently directed to the ſheriff for ſummoning four lawful knights before the juſtices of aſſize, in order to chuſe twelve knights of the neighbourhood, *&c.* to paſs upon the great aſſize between ſuch a perſon plaintiff, and ſuch a one defendant.

MAGNA CHARTA, the great charter of the liberties of Britain, and the baſis of our laws and privileges.

This charter may be ſaid to derive its origin from king Edward the Confeſſor, who granted ſeveral privileges to the church and ſtate by charter: theſe liberties and privileges were alſo granted and confirmed by king Henry I. by a celebrated great charter now loſt; but which was confirmed or re-enacted by king Henry II and king John. Henry III, the ſucceſſor of this laſt prince, after having cauſed twelve men to make inquiry into the liberties of England in the reign of Henry I. granted a new charter, which was the ſame as the preſent magna charta: this he ſeveral times confirmed and as often broke; till, in thirty-ſeventh year of his reign, he went to Weſtminiſter-hall, and there, in the preſence of the nobility and biſhops, who held lighted candles in their hands, magna charta was read, the king all the while holding his hand to his breaſt, and at laſt ſolemnly ſwearing faithfully and inviolably to obſerve all the things therein contained, *&c.* then the biſhops extinguiſhing the candles, and throwing them on the ground, they all cried out, "Thus let him be extinguiſhed, and ſtink in hell, who violates this charter." It is obſerved, that notwithſtanding the ſolemnity of this confirmation, king Henry, the very next year, again invaded the rights of his people, till the barons entered into a war againſt him, when, after various ſucceſs, he confirmed this charter, and the charter of the foreſt, in the fifty ſecond year of his reign. This excellent charter, ſo equitable and beneficial to the ſubject, is the ancienteſt written law in the kingdom: by the 25 Edw. I. it is ordained that it ſhall be taken as the common law; and by the 43 Edward III. all ſtatutes made againſt it are declared to be void.

MAGNESIA. See CHEMISTRY, p. 119.

MAGNET, or LOADSTONE, in natural hiſtory, a very rich iron ore, found in large detached maſſes, of a duſky iron-grey, often tinged with browniſh or reddiſh, and when broken appearing ſomething like the common emery, but leſs ſparkling. It is very heavy, conſiderably hard, of a perfectly irregular and uneven ſurface, and of a firm ſtructure, but uſually with ſome porous irregularities within. It is found in Britain, and all other places where there are iron mines. See MECHANICS.

MAGNIFYING, the making of objects appear larger than they would otherwiſe do: whence convex lenſes, which have the power of doing this, are called magnifying glaſſes. See OPTICS.

MAGNITUDE, whatever is made up of parts locally extended, or that hath ſeveral dimenſions; as a line, ſurface, ſolid, *&c.*

MAGNOLIA, in botany, a genus of the polyandria polygynia claſs. The calix conſiſts of three leaves, and the corolla of nine petals; the capſules are imbricated, and have two valves; and the ſeed is a pendulous berry. There are four ſpecies, all natives of America.

MAGPY, in ornithology. See CORVUS.

MAHOMETANS, thoſe who believe in the religion and divine miſſion of Mahomet, or Mohammed.

It will not be improper here to give a general account of this extraordinary perſon, and the religion which he had the addreſs to propagate over moſt of the eaſtern nations.

Mohammed was born in the reign of Anuſhirwan the Juſt, emperor of Perſia, about the end of the 6th century of the Chriſtian æra. He came into the world under ſome diſadvantages. His father Abd'allah was a younger ſon of Abd'almotalleb, and, dying very young, and in his father's life time, left his widow and infant ſon in very mean circumſtances, his whole ſubſtance conſiſting but of five camels and one Ethiopian ſhe-ſlave. Abd'almotalleb was therefore obliged to take care of his grandchild Mohammed, which he not only did during his life, but at his death enjoined his eldeſt ſon Abu Taleb, who was brother to Abd'allah by the ſame mother, to provide for him for the future; which he very affectionately did, and inſtructed him in the buſineſs of a merchant which he followed; and to that end he took him into Syria when he was but thirteen, and

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and afterwards recommended him to Khadijah, a noble and rich widow, for her factor; in whoſe ſervice he behaved himſelf ſo well, that by making him her huſband ſhe ſoon raiſed him to an equality with the richeſt in Mecca.

After he began by this advantageous match to live at his eaſe, it was that he formed the ſcheme of eſtabliſhing a new religion, or, as he expreſſed it, of replanting the only true and ancient one, profeſſed by Adam, Noah, Abraham, Moſes, Jeſus, and all the prophets, by deſtroying the groſs idolatry into which the generality of his countrymen had fallen, and weeding out the corruptions and ſuperſtitions which the latter Jews and Chriſtians had, as he thought, introduced into their religion, and reducing it to its original purity, which conſiſted chiefly in the worſhip of one only God.

Before he made any attempt abroad, he rightly judged that it was neceſſary for him to begin with the converſion of his own houſehold. Having therefore retired with his family, as he had done ſeveral times before, to a cave in mount *Hara*, he there opened the ſecret of his miſſion to his wife Khadijah; and acquainted her that the angel Gabriel had juſt before appeared to him, and told him that he was appointed the apoſtle of God: he alſo repeated to her a paſſage which he pretended had been revealed to him by the miniſtry of the angel, with thoſe other circumſtances of this firſt appearance, which are related by the Mohammedan writers. Khadijah received the news with great joy; ſwearing by him in whoſe hands her ſoul was, that ſhe truſted he would be the prophet of his nation; and immediately communicated what ſhe had heard to her couſin Warakah Ebn Nawfal, who, being a Chriſtian, could write in the Hebrew character, and was tolerably well verſed in the ſcriptures; and he as readily came into her opinion, aſſuring her that the ſame angel who had formerly appeared unto Moſes was now ſent to Mohammed. The firſt overture the prophet made in the month of Ramadan, in the fortieth year of his age, which is therefore uſually called the year of his miſſion.

Encouraged by ſo good a beginning, he reſolved to proceed, and try for ſome time what he could do by private perſuaſion, not daring to hazard the whole affair by expoſing it too ſuddenly to the public. He ſoon made proſelytes of thoſe under his own roof, *viz.* his wife Khadijah, his ſervant Zeid Ebn Haretha (to whom he gave his freedom on that occaſion, which afterwards became a rule to his followers) and his couſin and pupil Ali, the ſon of Abu Taleb, though then very young: but this laſt, making no account of the other two, uſed to ſtyle himſelf the *firſt of believers*. The next perſon Mohammed applied to was Abd'allah Ebn Abi Kohafa, ſurnamed Abu Becr, a man of great authority among the Koreiſh, and one whoſe intereſt he well knew would be of great ſervice to him; as it ſoon appeared: for Abu Becr, being gained over, prevailed alſo on Othman Ebn Affan, Abd' alraham Ebn Awf, Saad Ebn Abi Wakkas, al Zobeir Ebn al Awam, and Telha Ebn Obeid'allah, all principal men of Mecca, to follow his example. Theſe men were the ſix chief companions, who, with a few more, were converted in the ſpace of three years; at the end of which, Mohammed having, as he hoped, a ſufficient intereſt to ſupport him, made his miſſion no longer a ſecret, but gave out that God had commanded him to admoniſh his near relations, and, in order to do it with more convenience and proſpect of ſucceſs, he directed Ali to prepare an entertainment, and invite the ſons and deſcendants of Abd'almoſalleb, intending then to open his mind to them: this was done, and about forty of them came; but Abu Laheb, one of his uncles, making the company break up before Mohammed had an opportunity of ſpeaking, obliged him to give them a ſecond invitation the next day; and when they were come, he made them the following ſpeech: "I know no man in all Arabia who can offer his kindred a more excellent thing than I now do you: I offer you happineſs both in this life, and in that which is to come; God Almighty hath commanded me to call you unto him; Who therefore among you will be aſſiſtant to me herein, and become my brother and my vicegerent?" All of them heſitating, and declining the matter, Ali at length roſe up, and declared that he would be his aſſiſtant; and vehemently threatened thoſe who ſhould oppoſe him. Mohammed upon this embraced Ali with great demonſtrations of affection, and deſired all who were preſent to hearken to and obey him, as his deputy; at which the company broke out into a great laughter, telling Abu Taleb that he muſt now pay obedience to his ſon.

This repulſe however was ſo far from diſcouraging Mohammed, that he began to preach in public to the people, who heard him with ſome patience, till he came to upbraid them with the idolatry, obſtinacy, and perverſeneſs of themſelves and their fathers; which ſo highly provoked them, that they declared themſelves his enemies, and would ſoon have procured his ruin, had he not been protected by Abu Taleb. The chief of the Koreiſh warmly ſolicited this perſon to deſert his nephew, making frequent remonſtrances againſt the innovations he was attempting; which proving ineffectual, they at length threatened him with an open rupture, if he did not prevail on Mohammed to deſiſt. At this Abu Taleb was ſo far moved, that he earneſtly diſſuaded his nephew from purſuing the affair any farther, repreſenting the great danger he and his friends muſt otherwiſe run. But Mohammed was not to be intimidated, telling his uncle plainly, *that if they ſet the ſun againſt him on his right hand, and the moon on his left, he would not leave his enterprize:* and Abu Taleb, ſeeing him ſo firmly reſolved to proceed, uſed no further arguments, but promiſed to ſtand by him againſt all his enemies.

The Koreiſh, finding they could prevail neither by fair words nor menaces, tried what they could do by force and ill treatment; uſing Mohammed's followers ſo very injuriouſly, that it was not ſafe for them to continue at Mecca any longer; whereupon Mohammed gave leave to ſuch of them as had not friends to protect them to ſeek for refuge elſewhere. And accordingly, in the fifth year of the prophet's miſſion, ſixteen of them, four of whom were women, fled into Ethiopia; and among them Othman Ebn Affan and his wife Rakiah, Mohammed's daughter. This was the firſt flight; but afterwards ſeveral others followed them, retiring one after another, to the number of eighty-three men and eighteen women, beſides

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beſides children. Theſe refugees were kindly received by the Najaſhi, or king of Ethiopia, who refuſed to deliver them up to thoſe whom the Koreiſh ſent to demand them, and, as the Arab writers unanimouſly atteſt, even profeſſed the Mohammedan religion.

In the ſixth year of his miſſion Mohammed had the pleaſure of ſeeing his party ſtrengthened by the converſion of his uncle Hamza, a man of great valour and merit, and of Omar Ebn al Khattab, a perſon highly eſteemed, and once a violent oppoſer of the prophet. As perſecution generally advances rather than obſtructs the ſpreading of a religion, Iſlamiſm made ſo great a progreſs among the Arab tribes, that the Koreiſh, to ſuppreſs it effectually, if poſſible, in the ſeventh year of Mohammed's miſſion, made a ſolemn league or covenant againſt the Haſhemites and the family of Abd'almotalleb, engaging themſelves to contract no marriages with any of them, and to have no communication with them; and, to give it the greater ſanction, reduced it into writing, and laid it up in the Caaba. Upon this the tribe became divided into two factions; and the family of Haſhem all repaired to Abu Taleb, as their head; except only Abd'al Uzza, ſurnamed Abu Laheb, who, out of his inveterate hatred to his nephew and his doctrine, went over to the oppoſite party, whoſe chief was Abu Sofian Ebn Harb, of the family of Ommeya.

The families continued thus at variance for three years; but, in the tenth year of his miſſion, Mohammed told his uncle Abu Taleb, that God had manifeſtly ſhewed his diſapprobation of the league which the Koreiſh had made againſt them, by ſending a worm to eat out every word of the inſtrument, except the name of God. Of this accident Mohammed had probably ſome private notice; for Abu Taleb went immediately to the Koreiſh and acquainted them with it; offering, if it proved falſe, to deliver his nephew up to them; but, in caſe it were true, he inſiſted that they ought to lay aſide their animoſity, and annul the league they had made againſt the Haſhemites. To this they acquieſced, and, going to inſpect the writing, to their great aſtoniſhment found it to be as Abu Taleb had ſaid; and the league was thereupon declared void.

In the ſame year Abu Taleb died, at the age of above fourſcore; and it is the general opinion that he died an infidel; though others ſay, that when he was at the point of death he embraced Mohammediſm, and produce ſome paſſages out of his poetical compoſitions to confirm their aſſertion. About a month, or, as ſome write, three days after the death of this great benefactor and patron, Mohammed had the additional mortification to loſe his wife Khadijah, who had ſo generouſly made his fortune. For which reaſon this year is called the *year* of *mourning*.

On the death of theſe two perſons the Koreiſh began to be more troubleſome than ever to their prophet, and eſpecially ſome who had formerly been his intimate friends; inſomuch that he found himſelf obliged to ſeek for ſhelter elſewhere, and firſt pitched upon Tayef, about ſixty miles eaſt from Mecca, for the place for his retreat. Thither therefore he went, accompanied by his ſervant Zied, and applied himſelf to two of the chief of the tribe of Thakif who were the inhabitants of that place; but they received them very coldly. However, he ſtaid there a month; and ſome of the more conſiderate and better ſort of men treated him with a little reſpect: but the ſlaves and inferior people at length roſe againſt him, and, bringing him to the wall of the city, obliged him to depart, and return to Mecca; where he put himſelf under the protection of al Motaam Ebn Adi.

This repulſe greatly diſcouraged his followers: however, Mohammed was not wanting to himſelf, but boldly continued to preach to the public aſſemblies at the pilgrimage, and gained ſeveral proſelytes, and among them ſix of the inhabitants of Yathreb of the Jewiſh tribe of Khazraj, who, on their return home, failed not to ſpeak much in commendation of their new religion, and exhorted their fellow-citizens to embrace the ſame.

In the twelfth year of his miſſion it was that Mohammed gave out that he had made his night journey from Mecca to Jeruſalem, and thence to heaven, ſo much ſpoken of by all that write of him. Dr Prideaux thinks he invented it, either to anſwer the expectations of thoſe who demanded ſome miracle as a proof of his miſſion; or elſe, by pretending to have converſed with God, to eſtabliſh the authority of whatever he ſhould think fit to leave behind by way of oral tradition, and make his ſayings to ſerve the ſame purpoſe as the oral law of the Jews. But it does not appear that Mohammed himſelf ever expected ſo great a regard ſhould be paid to his ſayings, as his followers have ſince done; and ſeeing he all along diſclaimed any power of performing miracles, it ſeems rather to have been a fetch of policy to raiſe his reputation, by pretending to have actually converſed with God in heaven, as Moſes had heretofore done in the mount, and to have received ſeveral inſtitutions immediately from him, whereas before he contented himſelf with perſuading them that he had all by the miniſtry of Gabriel.

However, this ſtory ſeemed ſo abſurd and incredible, that ſeveral of his followers left him upon it; and had probably ruined the whole deſign, had not Abu Becr vouched for his veracity, and declared that, if Mohammed affirmed it to be true, he verily believed the whole. Which happy incident not only retrieved the prophet's credit, but increaſed it to ſuch a degree, that he was ſecure of being able to make his diſciples ſwallow whatever he pleaſed to impoſe on them for the future. And this fiction, notwithſtanding its extravagance, was one of the moſt artful contrivances Mohammed ever put in practice, and what chiefly contributed to the raiſing of his reputation to that great height to which it afterwards arrived.

In this year, called by the Mohammedans the *accepted year*, twelve men of Yathreb or Medina, of whom ten were of the tribe of Khazraj, and the other two of that of Aws, came to Mecca, and took an oath of fidelity to Mohammed at al Akaba, a hill on the north of that city. This oath was called *the womens oath*; not that any women were preſent at this time, but becauſe a man was not thereby obliged to take up arms in defence of Mohammed or his religion; it being the ſame oath that was afterwards exacted of the women, the form of which we have in the Koran, and is to this effect; *viz.* That they ſhould renounce all idolatry; and they ſhould not ſteal, nor commit fornication, nor kill their children (as the

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Pagan Arabs uſed to do when they apprehended they ſhould not be able to maintain them,) nor forge calumnies; and that they ſhould obey the prophet in all things that were reaſonable. When they had ſolemnly engaged to all this, Mohammed ſent one of his diſciples, named Maſab Ebn Omair, home with them, to inſtruct them more fully in the grounds and ceremonies of his new religion.

Maſab being arrived at Medina, by the aſſiſtance of thoſe who had been formerly converted, gained ſeveral proſelytes, particularly Oſaid Ebn Hodeira, a chief man of the city, and Saad Ebn Moadh, prince of the tribe of Aws; Mohammediſm ſpreading ſo faſt, that there was ſcarce a houſe wherein there were not ſome who had embraced it.

The next year, being the thirteenth of Mohammed's miſſion, Maſab returned to Mecca, accompanied by ſeventy three men and two women of Medina who had profeſſed Iſlamiſm, beſides ſome others who were as yet unbelievers. On their arrival, they immediately ſent to Mohammed, and offered him their aſſiſtance, of which he was now in great need; for his adverſaries were by this time grown ſo powerful in Mecca, that he could not ſtay there much longer without imminent danger. Wherefore he accepted their propoſal, and met them one night, by appointment, at al Akaba above-mentioned, attended by his uncle al Abbas, who, though he was not then a believer, wiſhed his nephew well, and made a ſpeech to thoſe of Medina, wherein he told them, that as Mohammed was obliged to quit his native city, and ſeek an aſylum elſewhere, and they had offered him their protection, they would do well not to deceive him; that if they were not firmly reſolved to defend, and not betray him, they had better declare their minds, and let him provide for his ſafety in ſome other manner. Upon their proteſting their ſincerity, Mohammed ſwore to be faithful to them, on condition that they ſhould protect him againſt all inſults, as heartily as they would their own wives and families. They then aſked him what recompence they were to expect if they ſhould happen to be killed in his quarrel; he anſwered, paradiſe. Whereupon they pledged their faith to him, and ſo returned home; after Mohammed had choſen twelve out of their number, who were to have the ſame authority among them as the twelve apoſtles of Chriſt had among his diſciples.

Hitherto Mohammed had propagated his religion by fair means, ſo that the whole ſucceſs of his enterprize, before his flight to Medina, muſt be atributed to perſuaſion only, and not to compulſion. For before this ſecond oath of fealty or inauguration at al Akaba, he had no permiſſion to uſe any force at all; and in ſeveral places of the Koran, which he pretended were revealed during his ſtay at Mecca, he declares his buſineſs was only to preach and admoniſh, that he had no authority to compel any perſon to embrace his religion; and that, whether people believe or not, was none of his concern, but belonged ſolely unto God. And he was ſo far from allowing his followers to uſe force, that he exhorted them to bear patiently thoſe injuries which were offered them on account of their faith; and, when perſecuted himſelf, choſe rather to quit the place of his birth and retire to Medina, than to make any reſiſtance. But this great paſſiveneſs and moderation ſeem entirely owing to his want of power, and the great ſuperiority of his oppoſers for the firſt twelve years of his miſſion; for no ſooner was he enabled, by the aſſiſtance of thoſe of Medina, to make head againſt his enemies, than he gave out, that God had allowed him and his followers to defend themſelves againſt the infidels; and at length, as his forces increaſed, he pretended to have the divine leave even to attack them; and to deſtroy idolatry, and ſet up the true faith by the ſword finding, by experience, that his deſigns would otherwiſe proceed very ſlowly, if they were not utterly overthrown; and knowing, on the other hand, that innovators, when they depend ſolely on their own ſtrength, and can compel, ſeldom run any riſque; from whence, ſays Machiavel, it follows, that all the armed prophets have ſucceeded, and the unarmed ones have failed. Moſes Cyrus, Theſeus, and Romulus, would not have been able to eſtabliſh the obſervance of their inſtitutions for any length of time, had they not been armed. The firſt paſſage of the Koran which gave Mohammed the permiſſion of defending himſelf by arms, is ſaid to have been that in the twenty-ſecond chapter; after which a great number to the ſame purpoſe were revealed.

That Mohammed had a right to take up arms for his own defence againſt his unjuſt perſecutors, may, perhaps, be allowed; but whether he ought afterwards to have made uſe of that means for the eſtabliſhing of his religion, is not ſo eaſy to determine. How far the ſecular power may or ought to interpoſe in affairs of this nature, mankind are not agreed. The method of converting by the ſword gives no very favourable idea of the faith which is ſo propagated, and is diſallowed by every body in thoſe of another religion, though the ſame perſons are willing to admit of it for the advancement of their own; ſuppoſing that, though a falſe religion ought not to be eſtabliſhed by authority, yet a true one may; and accordingly force is almoſt as conſtantly employed in theſe caſes by thoſe who have the power in their hands, as it is conſtantly complained of by thoſe who ſuffer the violence. It is certainly one of the moſt convincing proofs that Mohammediſm was no other than a human invention, that it owed its progreſs and eſtabliſhment almoſt entirely to the ſword; and it is one of the ſtrongeſt demonſtrations of the divine original of Chriſtianity, that it prevailed againſt all the force and powers of the world by the mere dint of its own truth, after having ſtood the aſſaults of all manner of perſecutions, as well as other oppoſitions, for three hundred years together, and at length made the Roman emperors themſelves ſubmit thereto; after which time, indeed, this proof ſeems to fail, Chriſtianity being then eſtabliſhed, and Paganiſm aboliſhed, by public authority, which has had great influence in the propagation of the one and deſtruction of the other ever ſince. But to return:

Mohammed, having provided for the ſecurity of his companions as well as his own, by the league offenſive and defenſive which he had now concluded with thoſe of Medina, directed them to repair thither, which they accordingly did; but himſelf with Abu Becr and Ali ſtaid behind, having not yet received the divine permiſſion, as he

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he pretended, to leave Mecca, The Koreiſh, fearing the conſequence of this new alliance, began to think it abſolutely neceſſary to prevent Mohammed's eſcape to Medina; and having held a council thereon, after ſeveral milder expedients had been rejected, they came to a reſolution that he ſhould be killed; and agreed that a man ſhould be choſen out of every tribe for the execution of this deſign; and that each man ſhould have a blow at him with his ſword, that the guilt of his blood might fall equally on all the tribes, to whoſe united power the Haſhemites were much inferior, and therefore durſt not attempt to revenge their kinſman's death.

This conſpiracy was ſcarce formed, when, by ſome means or other, it came to Mohammed's knowledge; and he gave out that it was revealed to him by the angel Gabriel, who had now ordered him to retire to Medina. Whereupon, to amuſe his enemies, he directed Ali to lie down in his place, and wrap himſelf up in his green cloak, which he did; and Mohammed eſcaped miraculouſly, as they pretend, to Abu Becr's houſe, unperceived by the conſpirators, who had already aſſembled at the prophet's door. They, in the mean time, looking through the crevice, and ſeeing Ali, whom they took to be Mohammed himſelf, aſleep, continued watching there till morning, when Ali aroſe, and they found themſelves deceived.

From Abu Becr's houſe Mohammed and he went to a cave in mount Thur, to the ſouth-eaſt of Mecca, accompanied only by Amer Ebn Foheirah, Abu Becr's ſervant, and Abd'allah Ebn Oreitah, an idolater whom they had hired for a guide. In this cave they lay hid three days, to avoid the ſearch of their enemies; which they very narrowly eſcaped, and not without the aſſiſtance of more miracles than one: for ſome ſay that the Koreiſh were ſtruck with blindneſs, ſo that they could not find the cave; others, that after Mohammed and his companions were got in, two pigeons laid their eggs at the entrance, and a ſpider covered the mouth of the cave with her web, which made them look no farther Abu Becr, ſeeing the prophet in ſuch imminent danger, became very ſorrowful; whereupon Mohammed comforted him with theſe words, recorded in the Koran, *Be not grieved, for God is with us.* Their enemies being retired, they left the cave, and ſet out for Medina, by a by road; and having fortunately, or, as the Mohammedans tell us, miraculouſly eſcaped ſome who were ſent to purſue them, arrived ſafely at that city; whither Ali followed them in three days, after he had ſettled ſome affairs at Mecca.

The firſt thing Mohammed did after his arrival at Medina, was to build a temple for his religious worſhip, and a houſe for himſelf, which he did on a parcel of ground which had before ſerved to put camels in, or, as others tell us, for a burying-ground and belonged to Sahal and Soheil the ſons of Amru who were orphans. This action Dr Prideaux exclaims againſt, repreſenting it as a flagrant inſtance of injuſtice; for that, ſays he, he violently diſpoſſeſſed theſe poor orphans, the ſons of an inferior artificer (whom the author he quotes calls a carpenter) of this ground, and ſo founded the firſt fabric of his worſhip with the like wickedneſs as he did his religion But, to ſay nothing of the improbability that Mohammed ſhould act in ſo impolitic a manner at his firſt coming, the Mohammedan writers ſet this affair in a quite different light: one tells us that he treated with the lads about the price of the ground, but they deſired he would accept it as a preſent: however, as hiſtorians of good credit aſſure us, he actually bought it; and the money was paid by Abu Becr. Beſides, had Mohammed accepted it as a preſent, the orphans were in circumſtances ſufficient to have afforded it; for they were of a very good family, of the tribe of Najjar, one of the moſt illuſtrious among the Arabs, and not the ſons of a carpenter. as Dr. Prideaux's author writes, who took the word Najjar, which ſignifies a carpenter, for an appellative, whereas it is a proper name.

Mohammed, being ſecurely ſettled at Medina, and able not only to defend himſelf againſt the inſults of his enemies, but to attack them, began to ſend out ſmall parties to make repriſals on the Koreiſh; the firſt party conſiſting of no more than nine men, who intercepted and plundered a caravan belonging to that tribe, and in the action took two priſoners. But what eſtabliſhed his affairs very much, and was the foundation on which he built all his ſucceeding greatneſs, was the gaining of the battle of Bedr, which was fought in the ſecond year of the Hejra, and is ſo famous in the Mohammedan hiſtory. Some reckon no leſs than twenty-ſeven expeditions wherein Mohammed was perſonally preſent, in nine of which he gave battle, beſides ſeveral other expeditions in which he was not preſent His forces he maintained partly by the contributions of his followers for this purpoſe, which he called by the name of zacat or alms, and the paying of which he very artfully made one main article of his religion; and partly by ordering a fifth part of the plunder to be brought into the public treaſury for that purpoſe, in which matter he likewiſe pretended to act by the divine direction.

In a few years by the ſucceſs of his arms (notwithſtanding he ſometimes came off by the worſt) he conſiderably raiſed his credit and power. In the ſixth year of the Hejra he ſet out with 1400 men to viſit the temple of Mecca, not with any intent of committing hoſtilities, but in a peaceable manner. However, when he came to al Hodeibiya, which is ſituate partly within and partly without the ſacred territory, the Koreiſh ſent to let him know that they would not permit him to enter Mecca, unleſs he forced his way; whereupon he called his troops about him and they all took a ſolemn oath of fealty or homage to him, and he reſolved to attack the city; but thoſe of Mecca ſending Arwa Ebn Maſud, prince of the tribe of Thakif, as their ambaſſador, to deſire peace, a truce was concluded between them for ten years, by which any perſon was allowed to enter into league either with Mohammed, or with the Koreiſh, as he thought fit.

It may not be improper to ſhew the inconceivable veneration and reſpect the Mohammedans by this time had for their prophet, to mention the account which the above-mentioned ambaſſador gave the Koreiſh, at his return, of their behaviour. He ſaid he had been at the courts both of the Roman emperor and of the king of Perſia and never ſaw any prince ſo highly reſpected by his ſubjects as Mohammed was by his companions; for, whenever he made the ablution, in order to ſay his prayers, they ran and catched the water that he had uſed; and, whenever he ſpit, they immediately licked it up, and gather-

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ed up every hair that fell from him with great ſuperſtition.

In the ſeventh year of the Hejra, Mohammed began to think of propagating his religion beyond the bounds of Arabia, and ſent meſſengers to the neighbouring princes, with letters to invite them to Mohammediſm. Nor was this project without ſome ſucceſs. Khoſru Parviz, then king of Perſia, received his letter with great diſdain, and tore it in a paſſion, ſending away the meſſenger very abruptly; which when Mohammed heard, he ſaid, *God ſhall tear his kingdom.* And ſoon after a meſſenger came to Mohammed from Badhan king of Yaman, who was a dependent on the Perſians, to acquaint him that he had received orders to ſend him to Khoſru. Mohammed put off his anſwer till the next morning, and then told the meſſenger it had been revealed to him that night that Khoſru was ſlain by his ſon Shiruyeh; adding, that he was well aſſured his new religion and empire ſhould riſe to as great a height as that of Khoſru; and therefore bid him adviſe his maſter to embrace Mohammediſm. The meſſenger being returned, Badhan in a few days received a letter from Shiruyeh, informing him of his father's death, and ordering him to give the prophet no further diſturbance. Whereupon Badhan and the Perſians with him turned Mohammedans.

The emperor Heraclius, as the Arabian hiſtorians aſſure us, received Mohammed's letter with great reſpect, laying it on his pillow, and diſmiſſed the bearer honourably. And ſome pretend that he would have profeſſed this new faith, had he not been afraid of loſing his crown.

Mohammed wrote to the ſame effect to the king of Ethiopia, though he had been converted before, according to the Arab writers; and to Mokawkas, governor of Egypt, who gave the meſſenger a very favourable reception, and ſent ſeveral valuable preſents to Mohammed, and among the reſt two girls, one of which, named Mary, became a great favourite with him. He alſo ſent letters of the like purport to ſeveral Arab princes; particularly one to al Hareth Ebn Abi Shamer king of Ghaſſean, who returning for anſwer that he would go to Mohammed himſelf, the prophet ſaid, *May his kingdom periſh;* another to Hawdha Ebn Ali, king of Yamama, who was a Chriſtian, and, having ſome time before profeſſed Iſlamiſm, had lately returned to his former faith; this prince ſent back a very rough anſwer, upon which Mohammed curſing him, he died ſoon after; and a third to al Mondar Ebn Sawa, king of Bahrein, who embraced Mohammediſm, and all the Arabs of that country followed his example.

The eighth year of the Hejra was a very fortunate year to Mohammed. In the beginning of it, Khaled Ebn al Walid and Amru Ebn al As, both excellent ſoldiers, the firſt of whom afterwards conquered Syria and other countries, and the latter Egypt, became proſelytes of Mohammediſm. And ſoon after the prophet ſent 3000 men againſt the Grecian forces, to revenge the death of one of his ambaſſadors, who being ſent to the governor of Boſra on the ſame errand as thoſe who went to the above-mentioned princes, were ſlain by an Arab, of the tribe of Ghaſſan, at Muta, a town in the territory of Balka in Syria, about three days journey eaſtward from Jeruſalem, near which town they encountered. The Grecians being vaſtly ſuperior in number (for, including the auxiliary Arabs, they had an army of 100,000 men) the Mohammedans were repulſed in the firſt attack, and loſt ſucceſſively three of their generals, viz. Zeid Ebn Haretha Mohammed's freedman, Jaafar the ſon of Abu Taleb, and Abdallah Ebn Rawaha; but Khaled Ebn al Walid, ſucceeding to the command, overthrew the Greeks with a great ſlaughter, and brought away abundance of rich ſpoil; on occaſion of which action Mohammed gave him the honourable title of Seif min ſoyuf Allah, *one of the ſwords of* GOD.

In this year alſo Mohammed took the city of Mecca, the inhabitants whereof had broken the truce concluded on two years before. For the tribe of Becr, who were confederates with the Koreiſh, attacking thoſe of Khozaah, who were allies of Mohammed, killed ſeveral of them, being ſupported in the action by a party of the Koreiſh themſelves. The conſequence of this violation was ſoon apprehended; and Abu Sofian himſelf made a journey to Medina on purpoſe to heal the breach and renew the truce; but in vain: for Mohammed, glad of this opportunity, refuſed to ſee him: whereupon he applied to Abu Becr and Ali; but they giving him no anſwer, he was obliged to return to Mecca as he came.

Mohammed immediately gave orders for preparations to be made, that he might ſurpriſe the Meccans while they were unprovided to receive him: in a little time he began his march thither, and by that time he came near the city his forces were increaſed to 10,000 men. Thoſe of Mecca, being not in a condition to defend themſelves againſt ſo formidable an army, ſurrendered at diſcretion; and Abu Sofian ſaved his life by turning Mohammedan. About twenty-eight of the idolaters were killed by a party under the command of Khaled; but this happened contrary to Mohammed's orders, who, when he entered the town, pardoned all the Koreiſh, on their ſubmiſſion, except only ſix men and four women, who were more obnoxious than ordinary (ſome of them having apoſtatiſed) and were ſolemnly proſcribed by the prophet himſelf; but of theſe no more than threemen and one woman were put to death, the reſt obtaining pardon on their embracing Mohammediſm, and one of the women making her eſcape.

The remainder of this year Mohammed employed in deſtroying the idols in and round Mecca, ſending ſeveral of his generals on expeditions for that purpoſe, and to invite the Arabs to Iſlamiſm; wherein it is no wonder if they now met with ſucceſs.

The next year, being the ninth of the Hejra, the Mohammedans call *the year of embaſſies:* for the Arabs had been hitherto expecting the iſſue of the war between Mohammed and the Koreiſh; but, ſo ſoon as that tribe, the principal of the whole nation, and the genuine deſcendants of Iſhmael, whoſe prerogatives none offered to diſpute, had ſubmitted, they were ſatisfied that it was not in their power to oppoſe Mohammed, and therefore began to come in to him in great numbers, and to ſend embaſſies to make their ſubmiſſions to him, both to Mecca, while he ſtaid there, and alſo to Medina, whither he returned this year. Among the reſt; five kings of the tribe of Hamyar profeſſed Mohammediſm, and ſent ambaſſadors to notify the ſame.

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In the tenth year Ali was ſent into Yaman to propagate the Mohammedan faith there, and, as it is ſaid, converted the whole tribe of Hamdan in one day. Their example was quickly followed by all the inhabitants of that province, except only thoſe of Najran, who, being Chriſtians, choſe rather to pay tribute.

Thus was Mohammediſm eſtabliſhed, and idolatry rooted out, even in Mohammed's life-time (for he died the next year) throughout all Arabia, except only Yamama, where Moſeilama, who ſet up alſo for a prophet as Mohammed's competitor, had a great party, and was not reduced till the Khalifat of Abu Becr: and the Arabs, being then united in one faith and under one prince, found themſelves in a condition of making thoſe conqueſts, which extended the Mohammedan faith over ſo great a part of the world.

Of the Koran. The word *Koran*, derived from the verb karaa, *to read*, ſignifies properly, in Arabic, *the reading*, or, rather, *that which ought to be read*; by which name the Mohammedans denote not only the entire book or volume of the Koran, but alſo any particular chapter or ſection of it; juſt as the Jews call either the whole ſcripture, or any part of it, by the name of Karah, or Mikra, words of the ſame origin and import. See Alcoran.

Beſide this peculiar name, the Koran is alſo honoured with ſeveral appellations, common to other books of ſcripture: as, *al Farkan*, from the verb *foraka*, *to divide or diſtinguiſh*; not, as the Mohammedan doctors ſay, becauſe thoſe books are divided into chapters or ſections, or diſtinguiſh between good and evil; but in the ſame notion that the Jews uſe the word Perek, or Pirka, from the ſame root, to denote a ſection or portion of ſcripture. It is alſo called al Moſhaf, *the volume*, and all Kitab, *the book*, by way of eminence, which anſwers to the *Biblia* of the Greeks; and al Dhikr, *the admonition*, which name is alſo given to the Pentateuch and Goſpel.

The Koran is divided into 114 larger portions of very unequal length, which we call *chapters*, but the Arabians *Sowar*, in the ſingular *Sura*, a word rarely uſed on any other occaſion, and properly ſignifying a row, order, or a regular ſeries; as a courſe of bricks in building, or a rank of ſoldiers in an army; and is the ſame in uſe and import with the Sura, or Tora of the Jews, who alſo call the fifty three ſections of the Pentateuch Sedarim, a word of the ſame ſignification.

Theſe chapters are not in the manuſcript copies diſtinguiſhed by their numerical order, but by particular titles, which are taken ſometimes from a particular matter treated of, or perſon mentioned therein; but uſually from the firſt word of note, exactly in the ſame manner as the Jews have named their Sedarim; though the word from which ſome chapters are denominated be very far diſtant, towards the middle, or perhaps the end of the chapter; which ſeems ridiculous. But the occaſion of this ſeems to have been, that the verſe or paſſage wherein ſuch word occurs, was, in point of time, revealed and committed to writing before the other verſes of the ſame chapter which precede it in order; and the title being given to the chapter before it was completed, or the paſſages reduced to their preſent order, the verſe from whence ſuch title was taken did not always happen to begin the chapter. Some chapters have two or more titles, occaſioned by the difference of the copies.

Some of the chapters having been revealed at Mecca, and others at Medina, the noting this difference makes a part of the title: but the reader will obſerve that ſeveral of the chapters are ſaid to have been revealed partly at Mecca, and partly at Medina; and, as to others, it is yet a diſpute among the commentators to which place of the two they belong.

Every chapter is ſubdivided into ſmaller portions, of very unequal length alſo, which we cuſtomarily call *verſes*: but the Arabic word is *Ayat*, the ſame with the Hebrew *Oioth*, and ſignifies *ſigns*, or *wonders*; ſuch as are the ſecrets of God, his attributes, works, judgments, and ordinances, delivered in thoſe verſes; many of which have their particular titles alſo, impoſed in the ſame manner as thoſe of the chapters.

Beſides theſe unequal diviſions of chapter and verſe, the Mohammedans have alſo divided their Koran into ſixty equal portions, which they call Ahzab, in the ſingular Hizb, each ſubdivided into four equal parts; which is alſo an imitation of the Jews, who have an ancient diviſion of their Miſhna into ſixty portions called Maſſicoth: but the Koran is more uſually divided into thirty ſections only, named Ajza, from the ſingular Joz, each of twice the length of the former, and in the like manner ſubdivided into four parts. Theſe diviſions are for the uſe of the readers of the Koran in the royal temples, or in the adjoining chapels where the emperors and great men are interred. There are thirty of theſe readers belonging to every chapel, and each reads his ſection every day, ſo that the whole Koran is read over once a-day.

Next after the title, at the head of every chapter, except only the ninth, is prefixed the following ſolemn form, by the Mohammedans called the Biſmallah, In the name of the most merciful God; which form they conſtantly place at the beginning of all their books and writings in general, as a peculiar mark or diſtinguiſhing characteriſtic of their religion, it being counted a ſort of impiety to omit it. The Jews, for the ſame purpoſe, make uſe of the form, *In the name of the* Lord, or, *In the name of the great* God: and the eaſtern *Chriſtians* that of, *In the name of the Father, and of the Son, and of the Holy Ghoſt*. But Mohammed probably took this form, as he did many other things, from the Perſian Magi, who uſed to begin their books in theſe words, *Benam Yezdan bakhſhaiſhgher dadar*; that is, *In the name of the moſt merciful juſt* God.

There are twenty-nine chapters of the Koran, which have this peculiarity, that they begin with certain letters of the alphabet, ſome with a ſingle one, others with more. Theſe letters the Mohammedans believe to be the peculiar marks of the Koran, and to conceal ſeveral profound myſteries, the certain underſtanding of which, the more intelligent confeſs, has not been communicated to any mortal, their prophet only excepted. Notwithſtanding which, ſome will take the liberty of gueſſing at their meaning by that ſpecies of Cabala called by the Jews Notarikon, and ſuppoſe the letters to ſtand for as many words, expreſſing

expreſſing the names and attributes of God, his works, ordinances, and decrees; and therefore theſe myſterious letters, as well as the verſes themſelves, ſeem in the Koran to be called ſigns. Others explain the intent of theſe letters from their nature or organ, or elſe from their value in numbers, according to another ſpecies of the Jewiſh Cabala called Gematria; the uncertainty of which conjectures ſufficiently appears from their diſagreement. Thus, for example, five chapters, one of which is the ſecond, begin with theſe letters, A. L. M. which ſome imagine to ſtand for, *Allah latif magid;* God *is gracious and to be glorified*; or, *Ana li minni, to me and from me*, viz. belongs all perfection, and proceeds all good; or elſe for *Ana Allah alam, I am the moſt wiſe* God, taking the firſt letter to mark the beginning of the firſt word, the ſecond the middle of the ſecond word, and the third the laſt of the third word; or for *Allah, Gabriel, Mohammed*, the author, revealer, and preacher of the Koran. Others ſay, that as the letter A belongs to the lower part of the throat, the firſt of the organs of ſpeech; L to the palate, the middle organ; and M to the lips, which are the laſt organ; ſo theſe letters ſignify that God is the beginning, middle, and end, or ought to be praiſed in the beginning, middle, and end, of all our words and actions: or, as the total value of thoſe three letters, in numbers, is ſeventy-one, they ſignify, that, in the ſpace of ſo many years, the religion preached in the Koran ſhould be fully eſtabliſhed. The conjecture of a learned Chriſtian is at leaſt as certain as any of the former, who ſuppoſes thoſe letters were ſet there by the *amanuenſis*, for *Amar li Mohammed*, i. e. *At the command of Mohammed*, as the five letters prefixed to the nineteenth chapter ſeem to be there written by a Jewiſh ſcribe, for *Cohyeas*, i. e. *Thus he commanded.*

The Koran is univerſally allowed to be written with the utmoſt elegance and purity of language, in the dialect of the tribe of Koreiſh, the moſt noble and polite of all the Arabians, but with ſome mixture, though very rarely, of other dialects. It is confeſſedly the ſtandard of the Arabic tongue, and, as the more orthodox believe, and are taught by the book itſelf, inimitable by any human pen, (though ſome ſectaries have been of another opinion) and therefore inſiſted on as a permanent miracle, greater than that of raiſing the dead, and alone ſufficient to convince the world of its divine original.

And to this miracle did Mohammed himſelf chiefly appeal for the confirmation of his miſſion, publicly challenging the moſt eloquent men in Arabia, which was at that time ſtocked with thouſands, whoſe ſole ſtudy and ambition it was to excel in elegance of ſtyle and compoſition, to produce even a ſingle chapter that might be compared with it.

The general deſign of the Koran ſeems to be this: to unite the profeſſors of the three different religions then followed in the populous country of Arabia, who, for the moſt part, lived promiſcuouſly, and wandered without guides, the far greater number being idolaters, and the reſt Jews and Chriſtians moſtly of erroneous and heterodox belief, in the knowledge and worſhip of one eternal, inviſible God, by whoſe power all things were made, and thoſe which are not may be; the ſupreme Governor, Judge, and abſolute Lord of the creation; eſtabliſhed under the ſanction of certain laws, and the outward ſigns of certain ceremonies, partly of ancient, and partly of novel inſtitution, and inforced by ſetting before them rewards and puniſhments, both temporal and eternal: and to bring them all to the obedience of Mohammed, as the prophet and ambaſſador of God, who, after the repeated admonitions, promiſes and threats of former ages, was at laſt to eſtabliſh and propagate God's religion on earth by force of arms, and to be acknowledged chief pontiff in ſpiritual matters, as well as ſupreme prince in temporal.

The great doctrine then of the Koran is the unity of God; to reſtore which point Mohammed pretended was the chief end of his miſſion; it being laid down by him, as a fundamental truth, that there never was, nor ever can be, more than one true orthodox religion. For, though the particular laws or ceremonies are only temporary, and ſubject to alteration, according to the divine direction; yet, the ſubſtance of it, being eternal truth, is not liable to change, but continues immutably the ſame. And he taught, that, whenever this religion became neglected, or corrupted in eſſentials, God had the goodneſs to re-inform and re-admoniſh mankind thereof, by ſeveral prophets, of whom Moſes and Jeſus were the moſt diſtinguiſhed, till the appearance of Mohammed, who is their ſeal, no other being to be expected after him. And the more effectually to engage people to hearken to him, great part of the Koran is employed in relating examples of dreadful puniſhments formerly inflicted by God on thoſe who rejected and abuſed his meſſengers; ſeveral of which ſtories, or ſome circumſtances of them, are taken from the Old and New Teſtament, but many more from the apocryphal books and traditions of the Jews and Chriſtians of thoſe ages, ſet up in the Koran as truths in oppoſition to the ſcriptures, which the Jews and Chriſtians are charged with having altered; and indeed few or none of the relations or circumſtances in the Koran were invented by Mohammed, as is generally ſuppoſed, it being eaſy to trace the greateſt part of them much higher, as the reſt might be, were more of thoſe books extant, and it was worth while to make the inquiry.

The other part of the Koran is taken up in giving neceſſary laws and directions, in frequent admonitions to moral and divine virtues, and, above all, to the worſhipping and reverencing of the only true God, and reſignation to his will; among which are many excellent things intermixed, not unworthy even a Chriſtian's peruſal.

But beſides theſe, there are a great number of paſſages which are occaſional, and relate to particular emergencies. For whenever any thing happened which perplexed and gravelled Mohammed, and which he could not otherwiſe get over, he had conſtant recourſe to a new revelation, as an infallible expedient in all nice caſes; and he found the ſucceſs of this method anſwer his expectation. It was certainly an admirable and politic contrivance of his to bring down the whole Koran at once to the loweſt heaven only, and not to the earth, as a bungling prophet would probably have done; for if the whole had been publiſhed at once, innumerable objections might have been made, which it would have been very hard, if not impoſſible,

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impoſſible, for him to ſolve: but as he pretended to have received it by parcels, as God ſaw proper that they ſhould be publiſhed for the converſion and inſtruction of the people, he had a ſure way to anſwer all emergencies, and to extricate himſelf with honour from any difficulty which might occur.

That Mohammed was really the author and chief contriver of the Koran, is beyond diſpute; though it be highly probable that he had no ſmall aſſiſtance in his deſign from others, as his countrymen failed not to object to him; however, they differed ſo much in their conjectures as to the particular perſons who gave him ſuch aſſiſtance, that they were not able, it ſeems, to prove the charge; Mohammed, it is to be preſumed, having taken his meaſures too well to be diſcovered. Dr. Prideaux has given the moſt probable account of this matter, though chiefly from Chriſtian writers, who generally mix ſuch ridiculous fables with what they deliver, that they deſerve not much credit.

However it be, the Mohammedans abſolutely deny the Koran was compoſed by their prophet himſelf, or any other for him; it being their general and orthodox belief that it is of divine original, nay, that it is eternal and uncreated, remaining, as ſome expreſs it, in the very eſſence of God; that the firſt tranſcript has been from everlaſting by God's throne, written on a table of vaſt bigneſs, called the *preſerved table*, in which are alſo recorded the divine decrees paſt and future: that a copy from this table, in one volume on paper, was by the miniſtry of the angel Gabriel ſent down to the loweſt heaven, in the month of Ramadan, on the night of *power*: from whence Gabriel revealed it to Mohammed by parcels, ſome at Mecca, and ſome at Medina, at different times, during the ſpace of twenty-three years, as the exigency of affairs required; giving him, however, the conſolation to ſhew him the whole (which they tell us was bound in ſilk, and adorned with gold and precious ſtones of paradiſe) once a year; but in the laſt year of his life he had the favour to ſee it twice. They ſay that few chapters were delivered entire, the moſt part being revealed piece-meal, and written down from time to time by the prophet's amanuenſes in ſuch or ſuch a part of ſuch or ſuch a chapter, till they were compleated, according to the directions of the angel. The firſt parcel that was revealed is generally agreed to have been the firſt five verſes of the ninety ſixth chapter

After the new revealed paſſages had been from the prophet's mouth taken down in writing by his ſcribe, they were publiſhed to his followers, ſeveral of whom took copies for their private uſe, but the far greater number got them by heart. The originals, when returned, were put promiſcuouſly into a cheſt, obſerving no order of time, for which reaſon it is uncertain when many paſſages were revealed.

When Mohammed died, he left his revelations in the ſame diſorder, and not digeſted into the method, ſuch as is is, which we now find them in. This was the work of his ſucceſſor Abu Becr, who, conſidering that a great number of paſſages were committed to the memory of Mohammed's followers, many of whom were ſlain in their wars, ordered the whole to be collected, not only from the palm-leaves and ſkins on which they had been written, and which were kept between two boards or covers, but alſo from the mouths of ſuch as had gotten them by heart. And this tranſcript, when completed, he committed to the cuſtody of Hafsa the daughter of Omar, one of the prophet's widows.

From this relation it is generally imagined that Abu Becr was really the compiler of the Koran; though, for aught appears to the contrary, Mohammed left the chapters complete as we now have them, excepting ſuch paſſages as his ſucceſſor might add or correct from thoſe who had gotten them by heart; what Abu Becr did elſe being, perhaps, no more than to range the chapters in their preſent order, which he ſeems to have done without any regard to time, having generally placed the longeſt firſt.

However, in the thirtieth year of the Hejra, Othman being then Khalif, and obſerving the great diſagreement in the copies of the Khoran in the ſeveral provinces of the empire, thoſe of Irak, for example, following the reading of Abu Muſa al Aſhari, and the Syrians that of Macdad Ebn Aſwad, he, by advice of the *companions*, ordered a great number of copies to be tranſcribed from that of Abu Becr, in Hafsa's care, under the inſpection of Zeid Ebn Thabet, Abd'allah Ebn Zobair, Said Ebn al As, and Ad'alrahman Ebn al Hareth the Makhzumite; whom he directed, that, where-ever they diſagreed about any word, they ſhould write it in the dialect of the Koreiſh, in which it was at firſt delivered. Theſe copies, when made, were diſperſed in the ſeveral provinces of the empire, and the old ones burnt and ſuppreſſed. Though many things in Hafsa's copy were corrected by the abovementioned ſupervitors, yet ſome few various readings ſtill occur.

The fundamental poſition, on which Mohammed erected the ſuperſtructure of his religion, was, That, from the beginning to the end of the world, there has been, and for ever will be, but one true orthodox belief; conſiſting, as to matter of faith, in the acknowledging of the only true God, and the believing in and obeying ſuch meſſengers or prophets as he ſhould from time to time ſend, with proper credentials, to reveal his will to mankind; and, as to matter of practice, in the obſervance of the immutable and eternal laws of right and wrong, together with ſuch other precepts and ceremonies as God ſhould think fit to order for the time being, according to the different diſpenſations in different ages of the world: for theſe laſt, he allowed, were things indifferent in their own nature, and became obligatory by God's poſitive precept only; and were therefore temporary, and ſubject to alteration, according to his will and pleaſure. And to this religion he gives the name of Iſlam, which word ſignifies *reſignation*, or *ſubmiſſion* to the ſervice and commands of God; and is uſed as the proper name of the Mohammedan religion, which they will alſo have to be the ſame at bottom with that of all the prophets from Adam.

Under pretext that this eternal religion was in his time corrupted, and profeſſed in its purity by no one ſect of men, Mohammed pretended to be a prophet ſent by God, to reform thoſe abuſes which had crept into it, and to reduce it to its primitive ſimplicity; with the addition however

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however of peculiar laws and ceremonies, ſome of which had been uſed in former times, and others were now firſt inſtituted. And he comprehended the whole ſubſtance of his doctrine under theſe two propoſitions, or articles of faith, *viz.* that there is but one God, and that himſelf was the apoſtle of God; in conſequence of which latter article, all ſuch ordinances and inſtitutions as he thought fit to eſtabliſh muſt be received as obligatory and of divine authority.

The Mohammedans divide their religion, which they call Iſlam, into two diſtinct parts; Iman, i. e. *faith*, or theory; and Din, i. e. *religion*, or practice; and teach that it is built on five fundamental points, one belonging to faith, and the other four to practice.

The firſt is, that *there is no god but the true* God; and *that* Mohammed *is his apoſtle*. Under which they comprehend ſix diſtinct branches, *viz.* 1. *Belief in* God; 2. *In his angels*; 3. *In his ſcriptures*; 4. *In his prophets*; 5. *In the reſurrection and day of judgment*; and, 6. *In* God's *abſolute decree and predetermination both of good and evil*.

The four points relating to practice are, 1. Prayer, under which are comprehended thoſe waſhings or purifications which are neceſſary preparations required before prayer; 2. Alms; 3. Faſting; and, 4. The pilgrimage to Mecca.

That both Mohammed, and thoſe among his followers who are reckoned orthodox, had and continue to have juſt and true notions of God and his attributes, appears ſo plain from the Koran itſelf, and all the Mohammedan divines, that it would be loſs of time to refute thoſe who ſuppoſe the God of Mohammed to be different from the true God, and only a fictitious deity, or idol of his own creation.

The exiſtence of angels, and their purity, are abſolutely required to be believed in the Koran; and he is reckoned an infidel who denies there are ſuch beings, or hates any of them, or aſſerts any diſtinction of ſexes among them. They believe them to have pure and ſubtile bodies, created of fire; that they neither eat nor drink, nor propagate their ſpecies; that they have various forms and offices; ſome adoring God in different poſtures, others ſinging praiſes to him, or interceding for mankind. They hold, that ſome of them are employed in writing down the actions of men, others in carrying the throne of God and other ſervices.

The four angels, whom they look on as more eminently in God's favour, and often mention on account of the offices aſſigned them, are Gabriel, to whom they give ſeveral titles, particularly thoſe of the *holy ſpirit*, and the *angel of revelations*, ſuppoſing him to be honoured by God with a greater confidence than any other, and to be employed in writing down the divine decrees; Michael, the friend and protector of the Jews; Azrael, the *angel of death*, who ſeparates mens ſouls from their bodies; and Iſrafil, whoſe office it will be to ſound the trumpet at the reſurrection. The Mohammedans alſo believe, that two guardian angels attend on every man, to obſerve and write down his actions, being changed every day, and therefore called al Moakkibat, or the angels who continually ſucceed one another.

The devil, whom Mohammed names Eblis, from his *deſpair*, was once one of thoſe angels who are neareſt to God's preſence, called Azazil; and fell, according to the doctrine of the Koran, for refuſing to pay homage to Adam at the command of God.

Beſides angels and devils, the Mohammedans are taught by the Koran to believe an intermediate order of creatures, which they call Jin or Genii, created alſo of fire, but of a groſſer fabric than angels; ſince they eat and drink, and propagate their ſpecies, and are ſubject to death. Some of theſe are ſuppoſed to be good, and others bad, and capable of future ſalvation or damnation, as men are; whence Mohammed pretended to be ſent for the converſion of genii as well as men.

As to the ſcriptures, the Mohammedans are taught by the Koran, that God, in divers ages of the world, gave revelations of his will in writing to ſeveral prophets, the whole and every word of which it is abſolutely neceſſary for a good Moſlem to believe. The number of theſe ſacred books were, according to them, 104. Of which ten were given to Adam, fifty to Seth, thirty to Edris or Enoch, ten to Abraham; and the other four, being the Pentateuch, the Pſalms, the Goſpel, and the Koran, were ſucceſſively delivered to Moſes, David, Jeſus, and Mohammed; which laſt being the ſeal of the prophets, thoſe revelations are now cloſed, and no more are to be expected. All theſe divine books, except the four laſt, they agree to be now entirely loſt, and their contents unknown; though the Sabians have ſeveral books which they attribute to ſome of the antediluvian prophets. And of thoſe four, the Pentateuch, Pſalms, and Goſpel, they ſay, have undergone ſo many alterations and corruptions, that, though there may poſſibly be ſome part of the true word of God therein, yet no credit is to be given to the preſent copies in the hands of the Jews and Chriſtians. The Mohammedans have alſo a goſpel in Arabic, attributed to St Barnabas, wherein the hiſtory of Jeſus Chriſt is related in a manner very different from what we find in the true Goſpels, and correſpondent to thoſe traditions which Mohammed has followed in his Koran. Of this Goſpel the Moriſcoes in Africa have a tranſlation in Spaniſh; and there is, in the library of prince Eugene of Savoy, a manuſcript of ſome antiquity, containing an Italian tranſlation of the ſame Goſpel, made, it is to be ſuppoſed, for the uſe of renegades. This book appears to be no original forgery of the Mohammedans, though they have no doubt interpolated and altered it ſince, the better to ſerve their purpoſe; and in particular, inſtead of the Paraclete or Comforter, they have in this apocryphal goſpel inſerted the word Periclyte, that is, the *famous* or *illuſtrious*, by which they pretend their prophet was foretold by name, that being the ſignification of Mohammed in Arabic: and this they ſay to juſtify that paſſage of the Koran, where Jeſus Chriſt is formally aſſerted to have foretold his coming, under his other name of Ahmed, which is derived from the ſame root as Mohammed, and of the ſame import. From theſe or ſome other forgeries of the ſame ſtamp, it is that the Mohammedans quote ſeveral paſſages, of which there are not the leaſt footſteps in the *New Teſtament*.

The number of the prophets, which have been from time

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time to time ſent by God into the world, amounts to no leſs than 224,000, according to one Mohammedan tradition, or to 124,000, according to another; among whom 313 were apoſtles, ſent with ſpecial commiſſions to reclaim mankind from infidelity and ſuperſtition; and ſix of them brought new laws or diſpenſations, which ſucceſſively abrogated the preceding: theſe were Adam, Noah, Abraham, Moſes, Jeſus, and Mohammed. All the prophets in general, the Mohammedans believe to have been free from great ſins and errors of conſequence, and profeſſors of one and the ſame religion, that is, Iſlam, notwithſtanding the different laws and inſtitutions which they obſerved. They allow of degrees among them, and hold ſome of them to be more excellent and honourable than others. The firſt place they give to the revealers and eſtabliſhers of new diſpenſations, and the next to the apoſtles.

In this great number of prophets, they not only reckon divers patriarchs and perſons named in ſcripture, but not recorded to have been prophets, (wherein the Jewiſh and Chriſtian writers have ſometimes led the way,) as Adam, Seth, Lot, Iſmael, Nun, Joſhua, *&c.* and introduce ſome of them under different names, as Enoch, Heber, and Jethro, who are called, in the Koran, Edris, Hud, and Shoaib; but ſeveral others whoſe very names do not appear in ſcripture (though they endeavour to find ſome perſons there to fix them on) as, Saleh, Khedr, Dhu'lkefl, *&c.*

The next article of faith required by the Koran is the belief of a general reſurrection and a future judgment.

When a corpſe is laid in the grave, they ſay he is received by an angel, who gives him notice of the coming of the two Examiners; which are two black livid angels, of a terrible appearance, named Monker and Nakir. Theſe order the dead perſon to ſit upright, and examine him concerning his faith, as to the unity of God, and the miſſion of Mohammed: if he anſwer rightly, they ſuffer the body to reſt in peace, and it is refreſhed by the air of paradiſe; but, if not, they beat him on the temples with iron maces, till he roars out for anguiſh ſo loud that he is heard by all from eaſt to weſt, except men and genii. Then they preſs the earth on the corpſe, which is gnawed and ſtung till the reſurrection by ninety-nine dragons, with ſeven heads each; or, as others ſay, their ſins will become venomous beaſts, the grievous ones ſtinging like dragons, the ſmaller like ſcorpions, and the others like ſerpents: circumſtances which ſome underſtand in a figurative ſenſe.

As to the ſoul, they hold, that, when it is ſeparated from the body by the angel of death, who performs his office with eaſe and gentleneſs towards the good, and with violence towards the wicked, it enters into that ſtate which they call al Berzakh, or *the interval* between death and the reſurrection. If the departed perſon was a believer, they ſay two angels meet it, who convey it to heaven, that its place there may be aſſigned, according to its merit and degree. For they diſtinguiſh the ſouls of the faithful into three claſſes; the firſt of prophets, whoſe ſouls are admitted into paradiſe immediately; the ſecond of martyrs, whoſe ſpirits, according to a tradition of Mohammed, reſt in the crops of green birds, which eat of the fruits and drink of the rivers of paradiſe; and the third of other believers, concerning the ſtate of whoſe ſouls before the reſurrection there are various opinions.

Though ſome among the Mohammedans have thought that the reſurrection will be merely ſpiritual, and no more than the returning of the ſoul to the place whence it firſt came (an opinion defended by Ebn Sina, and called by ſome the *opinion of the philoſophers*;) and others, who allow man to conſiſt of body only, that it will be merely corporeal; the received opinion is, that both body and ſoul will be raiſed; and their doctors argue ſtrenuouſly for the poſſibility of the reſurrection of the body, and diſpute with great ſubtilty concerning the manner of it. But Mohammed has taken care to preſerve one part of the body, whatever becomes of the reſt, to ſerve for a baſis of the future edifice, or rather a leaven for the maſs which is to be joined to it. For he taught, that a man's body was entirely conſumed by the earth, except only the bone called al Ajb, which we name the *os coccygis*, or rump bone; and that, as it was the firſt formed in the human body, it will alſo remain uncorrupted till the laſt day, as a ſeed from whence the whole is to be renewed: and this, he ſaid, would be effected by a forty days rain, which God ſhould ſend, and which would cover the earth to the height of twelve cubits, and cauſe the bodies to ſprout forth like plants. Herein, alſo, is Mohammed beholden to the Jews; who ſay the ſame things of the bone Luz, excepting that what he attributes to a great rain, will be effected, according to them, by a dew, impregnating the duſt of the earth.

The time of the reſurrection the Mohammedans allow to be a perfect ſecret to all but God alone; the angel Gabriel himſelf acknowledging his ignorance in this point, when Mohammed aſked him about it. However, they ſay, the approach of that day may be known from certain ſigns which are to precede it. Theſe ſigns they diſtinguiſh into two ſorts, the leſſer, and the greater.

The leſſer ſigns are, 1. The decay of faith among men. 2. The advancing of the meaneſt perſons to eminent dignity. 3. That a maid-ſervant ſhall become the mother of her miſtreſs (or maſter;) by which is meant, either that towards the end of the world men ſhall be much given to ſenſuality, or that the Mohammedans ſhall then take many captives. 4. Tumults and ſeditions. 5. A war with the Turks. 6. Great diſtreſs in the world, ſo that a man when he paſſes by another's grave, ſhall ſay, Would to God I were in his place. 7. That the provinces of Irak and Syria ſhall refuſe to pay their tribute. And, 8. That the buildings of Medina ſhall reach to Ahab, or Yahab.

The greater ſigns are,

1. The ſun's riſing in the weſt; which ſome have imagined it originally did.

2. The appearance of the beaſt, which ſhall riſe out of the earth, in the temple of Mecca, or on mount Safa, or in the territory of Tayef, or ſome other place. This beaſt, they ſay, is to be ſixty cubits high; though others, not ſatisfied with ſo ſmall a ſize, will have her reach to the clouds and to heaven, when her head only is out; and that ſhe will appear for three days, but ſhew only a third part of her body. They deſcribe this monſter, as

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to her form, to be a compound of various ſpecies; having the head of a bull, the eyes of a hog, the ears of an elephant, the horns of a ſtag, the neck of an oſtrich, the breaſt of a lion, the colour of a tiger, the back of a cat, the tail of a ram, the legs of a camel, and the voice of an aſs. Some ſay this beaſt is to appear three times in ſeveral places, and that ſhe will bring with her the rod of Moſes and the ſeal of Solomon; and, being ſo ſwift that none can overtake or eſcape her, will with the firſt ſtrike all the believers on the face, and mark them with the word mumen. *i. e.* believer; and with the latter will mark the unbelievers on the face likewiſe, with the word Cafer, *i. e. infidel*, that every perſon may be known for what he really is. They add, that the ſame beaſt is to demonſtrate the vanity of all religions except Iſlam, and to ſpeak Arabic. All this ſtuff ſeems to be the reſult of a confuſed idea of the beaſt in the Revelations.

3. War with the Greeks, and the taking Conſtantinople by 70,000 of the poſterity of Iſaac, who ſhall not win that city by force of arms, but the walls ſhall fall down while they cry out, *There is no God but* God: God *is moſt great!* As they are dividing the ſpoil, news will come to them of the appearance of Antichriſt; whereupon they ſhall leave all, and return back.

4. The coming of Antichriſt, whom the Mohammedans call Maſih al Dajjal, *i. e.* the falſe or lying Chriſt, and ſimply al Dajjal. He is to be one-eyed, and marked on the forehead with the letters C. F. R. ſignifying Cafer, or infidel. They ſay that the Jews give him the name of Meſſiah Ben David, and pretend he is to come in the laſt days, and to be lord both of land and ſea, and that he will reſtore the kingdom to them.

5. The deſcent of Jeſus on earth. They pretend that he is to deſcend near the white tower to the eaſt of Damaſcus, when the people are returned from the taking of Conſtantinople; that he is to embrace the Mohammedan religion, marry a wife, get children, kill Antichriſt, and at length die after forty years, or, according to others, twenty four years continuance on earth. Under him, they ſay, there will be great ſecurity, and plenty in the world, all hatred and malice being laid aſide; when lions and camels, bears and ſheep, ſhall live in peace, and a child ſhall play with ſerpents unhurt.

6. War with the Jews; of whom the Mohammedans are to make a prodigious ſlaughter, the very trees and ſtones diſcovering ſuch of them as hide themſelves, except only the tree called Gharkad, which is the tree of the Jews.

7. The eruption of Gog and Magog, or, as they are called in the eaſt, Yajuj and Majuj; of whom many things are related in the Koran and the traditions of Mohammed These barbarians, they tell us, having paſſed the lake of Tiberias, which the vanguard of their vaſt army will drink dry, will come to Jeruſalem, and there greatly diſtreſs Jeſus and his companions; till, at his requeſt, God will deſtroy them, and fill the earth with their carcaſes, which, after ſome time, God will ſend birds to carry away, at the prayers of Jeſus and his followers. Their bows, arrows, and quivers, the Moſlems will burn for ſeven years together; and at laſt, God will ſend a rain to cleanſe the earth, and to make it fertile.

8. A ſmoke, which ſhall fill the whole earth.

9. An eclipſe of the moon. Mohammed is reported to have ſaid, that there would be three eclipſes before the laſt hour; one to be ſeen in the eaſt, another in the weſt, and the third in Arabia.

10. The returning of the Arabs to the worſhip of Allat and al Uzza, and the reſt of their ancient idols, after the deceaſe of every one in whoſe heart there was faith equal to a grain of muſtard-ſeed, none but the very worſt of men being left alive. For God, they ſay, will ſend a cold odoriferous wind, blowing from Syria Damaſcena, which ſhall ſweep away the ſouls of all the faithful, and the Koran itſelf, ſo that men will remain in the groſſeſt ignorance for an hundred years.

11. The diſcovery of a vaſt heap of gold and ſilver by the retreating of the Euphrates, which will be the deſtruction of many.

12. The demolition of the Caaba, or temple of Mecca, by the Ethiopians.

13. The ſpeaking of beaſts and inanimate things.

14. The breaking out of fire in the province of Hejaz; or, according to others, in Yaman.

15. The appearance of a man of the decendants of Kahtan, who ſhall drive men before him with his ſtaff.

16 The coming of the Mohdi, or director; concerning whom Mohammed propheſied, that the world ſhould not have an end till one of his own family ſhould govern the Arabians, whoſe name ſhould be the ſame with his own name, and whoſe father's name ſhould alſo be the ſame with his father's name; and who ſhould fill the earth with righteouſneſs. This perſon the Shiites believe to be now alive, and concealed in ſome ſecret place, till the time of his manifeſtation; for they ſuppoſe him no other than the laſt of the twelve Imams, named Mohammed Abu'lkaſem, as their prophet was; and the ſon of Haſſan al Aſkeri, the eleventh of that ſucceſſion. He was born at Sermanrai in the 255th year of the Hejra From this tradition, it is to be preſumed, an opinion pretty current among the Chriſtians took its riſe, that the Mohammedans are in expectation of their prophet's return.

17. A wind which ſhall ſweep away the ſouls of all who have but a grain of faith in their hearts, as has been mentioned under the tenth ſign.

Theſe are the greater ſigns, which, according to their doctrine, are to precede the reſurrection, but ſtill leave the hour of it uncertain; for the immediate ſign of its being come will be the firſt blaſt of the trumpet; which they believe will be ſounded three times. The firſt they call the *blaſt of conſternation;* at the hearing of which all creatures in heaven and earth ſhall be ſtruck with terror, except thoſe whom God ſhall pleaſe to exempt from it. The effects attributed to this firſt ſound of the trumpet are very wonderful; for they ſay, the earth will be ſhaken, and not only all buildings, but the very mountains levelled; that the heavens ſhall melt, the ſun be darkened, the ſtars fall, on the death of the angels, who, as ſome imagine, hold them ſuſpended between heaven and earth; and the ſea ſhall be troubled and dried up, or, according to others, turned into flames, the ſun, moon, and ſtars being thrown into it: the Koran, to expreſs the greatneſs of the terror of that day, adds, that women who give

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give ſuck ſhall abandon the care of their infants, and even the ſhe camels which have gone ten months with young (a moſt valuable part of the ſubſtance of that nation) ſhall be utterly neglected. A farther effect of this blaſt will be that concourſe of beaſts mentioned in the Koran, though ſome doubt whether it be to precede the reſurrection or not. They who ſuppoſe it will precede, think that all kinds of animals, forgetting their reſpective natural fierceneſs and timidity, will run together into one place, being terrified by the ſound of the trumpet and the ſudden ſhock of nature.

The Mohammedans believe that this firſt blaſt will be followed by a ſecond, which they call the *blaſt of examination*; when all creatures both in heaven and earth ſhall die or be annihilated, except thoſe which God ſhall pleaſe to exempt from the common fate; and this, they ſay, ſhall happen in the twinkling of an eye, nay in an inſtant; nothing ſurviving except God alone, with paradiſe and hell, and the inhabitants of thoſe two places, and the throne of glory. The laſt who ſhall die will be the angel of death.

Forty years after this will be heard the *blaſt of reſurrection*, when the trumpet ſhall be ſounded the third time by Iſrafil, who, together with Grabriel and Michael, will be previouſly reſtored to life, and, ſtanding on the rock of the temple of Jeruſalem, ſhall, at God's command, call together all the dry and rotten bones, and other diſperſed parts of the bodies, and the very hairs, to judgment. This angel, having, by the divine order, ſet the trumpet to his mouth, and called together all the ſouls from all parts, will throw them into his trumpet, from whence, on his giving the laſt ſound, at the command of God, they will fly forth like bees, and fill the whole ſpace between heaven an earth, and then repair to their reſpective bodies, which the opening earth will ſuffer to ariſe: and the firſt who ſhall ſo ariſe, according to a tradition of Mohammed, will be himſelf. For this birth the earth will be prepared by the rain above mentioned, which is to fall continually for forty years, and will reſemble the ſeed of a man, and be ſupplied from the water under the throne of God, which is called *living water*; by the efficacy and virtue of which the dead bodies ſhall ſpring forth from their graves, as they did in their mother's womb, or as corn ſprouts forth by common rain, till they become perfect, after which breath will be breathed into them, and they will ſleep in their ſepulchres till they are raiſed to life at the laſt trump.

When thoſe who have riſen ſhall have waited the limited time, the Mohammedans believe God will at length appear to judge them; Mohammed undertaking the office of interceſſor, after it ſhall have been declined by *Adam*, *Noah*, *Abraham*, and *Jeſus*, who ſhall beg deliverance only for their own ſouls They ſay, that on this ſolemn occaſion God will come in the clouds, ſurrounded by angels, and will produce the books wherein the actions of every perſon are recorded by their guardian angels, and will command the prophets to bear witneſs againſt thoſe to whom they have been reſpectively ſent. Then every one will be examined concerning all his words and actions, uttered and done by him in this life; not as if God needed any information in theſe reſpects, but to oblige the perſon to make public confeſſion and acknowledgment of God's juſtice. The particulars of which they ſhall give an account, as Mohammed himſelf enumerated them, are, of their time, how they ſpent it; of their wealth, by what means they acquired it, and how they employed it; of their bodies, wherein they exerciſed them; of their knowledge and learning, what uſe they made of them. To the queſtions we have mentioned each perſon ſhall anſwer, and make his defence in the beſt manner he can, endeavouring to excuſe himſelf by caſting the blame of his evil deeds on others; ſo that a diſpute ſhall ariſe even between the ſoul and the body, to which of them their guilt ought to be imputed: the ſoul ſaying, *O Lord, my body I received from thee; for thou createdſt me without a hand to lay hold with, a foot to walk with, an eye to ſee with, or an underſtanding to apprehend with, till I came and entered into this body; therefore puniſh it eternally, but deliver me.* The body, on the other ſide, will make this apology: *O Lord, thou createdſt me like a ſtock of wood, having neither hand that I could lay hold with, nor foot that I could walk with, till this ſoul, like a ray of light, entered into me, and my tongue began to ſpeak, my eye to ſee, and my foot to walk; therefore puniſh it eternally, but deliver me.* But God will propound to them the following parable of the blind man and the lame man, which, as well as the preceding diſpute, was borrowed by the Mohammedans from the Jews. A certain king, having a pleaſant garden, in which were ripe fruits, ſet two perſons to keep it, one of whom was blind, and the other lame; the former not being able to ſee the fruit, nor the lattter to gather it: the lame man, however, ſeeing the fruit, perſuaded the blind man to take him upon his ſhoulders and by that means he eaſily gathered the fruit; which they divided between them. The lord of the garden coming ſome time after, and inquiring after his fruit, each began to excuſe himſelf: the blind man ſaid he had no eyes to ſee with, and the lame man that he had no feet to approach the trees. But the king, ordering the lame man to be ſet on the blind, paſſed ſentence on and puniſhed them both. And in the ſame manner will God deal with the body and the ſoul. As theſe apologies will not avail on that day, ſo will it alſo be in vain for any one to deny his evil actions, ſince men and angels, and his own members, nay, the very earth itſelf, will be ready to bear witneſs againſt him.

At this examination they alſo believe, that each perſon will have the book wherein all the actions of his life are written delivered to him; which books the righteous will receive in their right hand, and read with great pleaſure and ſatisfaction; but the ungodly will be obliged to take them, againſt their wills, in their left, which will be bound behind their backs, their right hand being tied up to their necks,

To ſhew the exact juſtice which will be obſerved on this great day of trial, the next thing they deſcribe is the *balance*, wherein all things ſhall be weighed They ſay it will be held by Gabriel; and that it is of ſo vaſt a ſize, that its two ſcales, one of which hangs over paradiſe, and the other over hell, are capacious enough to contain both heaven and earth. Though ſome are willing to underſtand what is ſaid in the Koran concerning this

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this balance allegorically, and only as a figurative repreſentation of God's equity; yet the more ancient and orthodox opinion is, that they are to be taken literally; and ſince words and actions, being mere accidents, are not capable of being themſelves weighed, they ſay that the books wherein they are written will be thrown into the ſcales, and according as thoſe wherein the good or evil actions are recorded ſhall preponderate, ſentence will be given: thoſe whoſe balances laden with good works ſhall be heavy, will be ſaved; but thoſe whoſe balances are light, will be condemned. Nor will any one have cauſe to complain that God ſuffers any good action to paſs unrewarded, becauſe the wicked for the good they do have their reward in this life, and therefore can expect no favour in the next.

This examination being paſt, and every one's works weighed in a juſt balance, that mutual retaliation will follow, according to which every creature will take vengeance one of another, or have ſatisfaction made them for the injuries which they have ſuffered. And, ſince there will then be no other way of returning like for like, the manner of giving this ſatisfaction will be by taking away a proportional part of the good works of him who offered the injury, and adding it to thoſe of him who ſuffered it. Which being done, if the angels (by whoſe miniſtry this is to be performed) ſay, *Lord, we have given to every one his due, and there remaineth of this perſon's good works ſo much as equalleth the weight of an ant*, God will, of his mercy, cauſe it to be doubled unto him, that he may be admitted into paradiſe; but if, on the contrary, his good works be exhauſted, and there remain evil works only, and there be any who have not yet received ſatisfaction from him, God will order that an equal weight of their ſins be added unto his, that he may be puniſhed for them in their ſtead, and he will be ſent to hell laden with both. This will be the method of God's dealing with mankind. As to brutes, after they ſhall have likewiſe taken vengeance of one another, he will command them to be changed into duſt; wicked men being reſerved to more grievous puniſhment, ſo that they ſhall cry out, on hearing this ſentence paſſed on the brutes, *Would to* God *that we were duſt alſo*. As to the genii, many Mohammedans are of opinion, that ſuch of them as are true believers, will undergo the ſame fate as the irrational animals, and have no other reward than the favour of being converted into duſt; and for this they quote the authority of their prophet.

The trials being over, and the aſſembly diſſolved, the Mohammedans hold, that thoſe who are to be admitted into paradiſe will take the right hand way, and thoſe who are deſtined to hell-fire will take the left; but both of them muſt firſt paſs the bridge called in Arabic *al Sirat*, which they ſay is laid over the midſt of hell, and deſcribe to be finer than a hair, and ſharper than the edge of a ſword; ſo that it ſeems very difficult to conceive how any one ſhall be able to ſtand upon it: for which reaſon, moſt of the ſect of the Motazalites reject it as a fable; though the orthodox think it a ſufficient proof of the truth of this article, that it was ſeriouſly affirmed by him who never aſſerted a falſehood, meaning their prophet; who, to add to the difficulty of the paſſage, has likewiſe declared, that this bridge is beſet on each ſide with briars and hooked thorns; which will however be no impediment to the good, for they ſhall paſs with wonderful eaſe and ſwiftneſs, like lightning, or the wind, Mohammed and his Moſlems leading the way; whereas the wicked, what with the ſlipperineſs and extreme narrowneſs of the path, the intangling of the thorns, and the extinction of the light which directed the former to paradiſe, will ſoon miſs their footing, and fall down headlong into hell, which is gaping beneath them.

As to the puniſhment of the wicked, the Mohammedans are taught, that hell is divided into ſeven ſtories or apartments, one below another, deſigned for the reception of as many diſtinct claſſes of the damned. The firſt, which they call Jehennam, they ſay, will be the receptacle of thoſe who acknowledged one God, that is, the wicked Mohammedans, who, after having there been puniſhed according to their demerits, will at length be releaſed. The ſecond, named Ladha, they aſſign to the Jews; the third, named al Hotama, to the Chriſtians; the fourth, named al Sair, to the Sabians; the fifth, named Sakar, to the Magians; the ſixth, named al Jahim, to the idolaters; and the ſeventh, which is the loweſt and worſt of all, and is called al Hawyat, to the hypocrites, or thoſe who outwardly profeſſed ſome religion, but in their hearts were of none. Over each of theſe apartments they believe there will be ſet a guard of angels, nineteen in number; to whom the damned will confeſs the juſt judgment of God, and beg them to intercede with him for ſome alleviation of their pain, or that they may be delivered by being annihilated.

Mohammed has, in his Koran and traditions, been very exact in deſcribing the various torments of hell, which, according to him, the wicked will ſuffer both from intenſe heat and exceſſive cold. We ſhall however enter into no detail of them here, but only obſerve, that the degrees of theſe pains will alſo vary in proportion to the crimes of the ſufferer, and the apartment he is condemned to; and that he who is puniſhed the moſt lightly of all will be ſhod with ſhoes of fire, the fervor of which will cauſe his ſkull to boil like a cauldron. The condition of theſe unhappy wretches, as the ſame prophet teaches, cannot be properly called either life or death; and their miſery will be greatly increaſed by their deſpair of being ever delivered from that place, ſince, according to that frequent expreſſion in the Koran, *they muſt remain therein for ever*. It muſt be remarked, however, that the infidels alone will be liable to eternity of damnation; for the Moſlems, or thoſe who have embraced the true religion, and have been guilty of heinous ſins, will be delivered thence after they ſhall have expiated their crimes by their ſufferings. The time which theſe believers ſhall be detained there, according to a tradition handed down from their prophet, will not be leſs than 900 years, nor more than 7000. And, as to the manner of their delivery, they ſay that they ſhall be diſtinguiſhed by the marks of proſtration on thoſe parts of their bodies with which they uſed to touch the ground in prayer, and over which the fire will therefore have no power; and that, being known by this characteriſtic, they will be releaſed by the mercy of God, at the interceſſion

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ceſſion of Mohammed and the bleſſed; whereupon thoſe who ſhall have been dead, will be reſtored to life, as has been ſaid; and thoſe whoſe bodies ſhall have contracted any ſootineſs or filth from the flames and ſmoke of hell, will be immerſed in one of the rivers of paradiſe, called the *river of life*, which will waſh them whiter than pearls.

The righteous, as the Mohammedans are taught to believe, having ſurmounted the difficulties, and paſſed the ſharp bridge above-mentioned, before they enter paradiſe, will be refreſhed by drinking at the *pond* of their prophet, who deſcribes it to be an exact ſquare of a month's journey in compaſs; its water, which is ſupplied by two pipes from al Cawthar, one of the rivers of paradiſe, being whiter than milk or ſilver, and more odoriferous than muſk, with as many cups ſet around it as there are ſtars in the firmament; of which water whoever drinks will thirſt no more for ever. This is the firſt taſte which the bleſſed will have of their future and now near approaching felicity.

Though paradiſe be ſo very frequently mentioned in the Koran, yet it is a diſpute among the Mohammedans whether it be already created, or be to be created hereafter; the Motazalites and ſome other ſectaries aſſerting that there is not at preſent any ſuch place in nature, and that the paradiſe which the righteous will inhabit in the next life will be different from that from which Adam was expelled. However, the orthodox profeſs the contrary, maintaining that it was created even before the world, and deſcribe it, from their prophet's traditions, in the following manner.

They ſay it is ſituate above the ſeven heavens (or in the ſeventh heaven) and next under the throne of God; and, to expreſs the amenity of the place, tell us, that the earth of it is of the fineſt wheat flour, or of the pureſt muſk, or, as others will have it, of ſaffron: that its ſtones are pearls and jacinths, the walls of its buildings enriched with gold and ſilver, and that the trunks of all its trees are of gold; among which the moſt remarkable is the tree called Tuba, or the tree of happineſs. Concerning this tree, they fable, that it ſtands in the palace of Mohammed, though a branch of it will reach to the houſe of every true believer; that it will be laden with pomegranates, grapes, dates, and other fruit, of ſurpriſing bigneſs, and of taſtes unknown to mortals. So that, if a man deſire to eat of any particular kind of fruit, it will immediately be preſented him; or, if he chuſe fleſh, birds ready dreſſed will be ſet before him, according to his wiſh. They add, that the boughs of this tree will ſpontaneouſly bend down to the hand of the perſon who would gather of its fruits, and that it will ſupply the bleſſed not only with food, but alſo with ſilken garments, and beaſts to ride on ready ſaddled and bridled, and adorned with rich trappings, which will burſt forth from its fruits; and that this tree is ſo large, that a perſon, mounted on the fleeteſt horſe, would not be able to gallop from one end of its ſhade to the other in a hundred years.

As plenty of water is one of the greateſt additions to the pleaſantneſs of any place, the Koran often ſpeaks of the rivers of paradiſe as a principal ornament thereof: ſome of theſe rivers, they ſay, flow with water, ſome with milk, ſome with wine, and others with honey; all taking their riſe from the root of the tree Tuba.

But all theſe glories will be eclipſed by the reſplendent and raviſhing girls of paradiſe, called, from their large black eyes, *Hur al oyun*, the enjoyment of whoſe company will be a principal felicity of the faithful. Theſe, they ſay, are created, not of clay, as mortal women are, but of pure muſk; being, as their prophet often affirms in his Koran, free from all natural impurities, defects, and inconveniences incident to the ſex, of the ſtricteſt modeſty, and ſecluded from public view in pavilions of hollow pearls, ſo large, that, as ſome traditions have it, one of them will be no leſs than four paraſangs (or, as others ſay, ſixty miles) long, and as many broad.

The name which the Mohammedans uſually give to this happy manſion, is *al Jannat*, or *the garden*; and ſometimes they call it, with an addition, *Jannat al Ferdaws*, *the garden of paradiſe*; *Jannat Aden*, *the garden of Eden*, (though they generally interpret the word *Eden*, not according to its acceptation in Hebrew, but according to its meaning in their own tongue, wherein it ſignifies a *ſettled* or *perpetual habitation*;). *Jannat alMawa*, *the garden of abode*; *Jannat al Naim*, *the garden of pleaſure*; and the like: by which ſeveral appellations, ſome underſtand ſo many different gardens, or at leaſt places of different degrees of felicity, (for they reckon no leſs than an hundred ſuch in all,) the very meaneſt whereof will afford its inhabitants ſo many pleaſures and delights, that one would conclude they muſt even ſink under them, had not Mohammed declared, that, in order to qualify the bleſſed for a full enjoyment of them, God will give to every one the abilities of an hundred men.

The ſixth great point of faith, which the Mohammedans are taught by the Koran to believe, is God's abſolute decree and predeſtination both of good and evil: For the orthodox doctrine is, that whatever hath or ſhall come to paſs in this world, whether it be good, or whether it be bad, proceedeth entirely from the divine will, and is irrevocably fixed and recorded from all eternity in the preſerved table: God having ſecretly predetermined not only the adverſe and proſperous fortune of every perſon in this world, in the moſt minute particulars, but alſo his faith or infidelity, his obedience or diſobedience, and conſequently his everlaſting happineſs or miſery after death; which fate or predeſtination it is not poſſible, by any foreſight or wiſdom, to avoid.

Of this doctrine Mohammed makes great uſe in his Koran for the advancement of his deſigns; encouraging his followers to fight without fear, and even deſperately, for the propagation of their faith, by repreſenting to them that all their caution could not avert their inevitable deſtiny, or prolong their lives for a moment; and deterring them from diſobeying or rejecting him as an impoſtor, by ſetting before them the danger they might thereby incur of being, by the juſt judgment of God, abandoned to ſeduction, hardneſs of heart, and a reprobate mind, as a puniſhment for their obſtinacy.

Of the four fundamental points of religious practice required by the Koran, the firſt is *prayer*, under which are alſo comprehended thoſe legal waſhings or purifications which are neceſſary preparations thereto.

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Of theſe purifications there are two degrees, one called *Ghoſl*, being a total immerſion or bathing of the body in water; and the other called *Wodu*, (by the Perſians, *Abdeſt*,) which is the waſhing of their faces, hands, and feet, after a certain manner. The firſt is required in ſome extraordinary caſes only, as after having lain with a woman, or been polluted by emiſſion of ſeed, or by approaching a dead body; women alſo being obliged to it after their courſes or childbirth. The latter is the ordinary ablution in common caſes, and before prayer, and muſt neceſſarily be uſed by every perſon before he can enter upon that duty. It is performed with certain formal ceremonies, which have been deſcribed by ſome writers, but much eaſier apprehended by ſeeing them done, than by the beſt deſcription.

That his followers might be more punctual in this duty, Mohammed is ſaid to have declared, that *the practice of religion is founded on cleanlineſs*, which is the *one half of the faith*, and *the key of prayer*, without which it will not be heard by God. That theſe expreſſions may be the better underſtood, *al Ghazali* reckons four degrees of purification; of which the firſt is the cleanſing of the body from all pollution, filth, and excrements; the ſecond, the cleanſing of the members of the body from all wickedneſs and unjuſt actions; the third, the cleanſing the heart from all blameable inclinations and odious vices; and the fourth, the purging a man's ſecret thoughts from all affections which may divert their attendance on God: adding, that the body is but as the outward ſhell, in reſpect to the heart, which is as the kernel.

Circumciſion, though it be not ſo much as once mentioned in the Koran, is yet held, by the Mohammedans, to be an ancient divine inſtitution, confirmed by the religion of iſlam, and, though not ſo abſolutely neceſſary but that it may be diſpenſed with in ſome caſes, yet highly proper and expedient. The Arabs uſed this rite for many ages before Mohammed, having probably learned it from Iſhmael, though not only his deſcendents, but the Hamyarites and other tribes practiſed the ſame. The Iſhmaelites, we are told, uſed to circumciſe their children, not on the eighth day, as is the cuſtom of the Jews, but when about twelve or thirteen years old, at which age their father underwent that operation; and the Mohammedans imitate them ſo far as not to circumciſe children before they be able at leaſt diſtinctly to pronounce that profeſſion of their faith, *There is no* God *but* God, Mohammed *is the apoſtle of* God; but pitch on what age they pleaſe for the purpoſe, between ſix or ſixteen, or thereabouts.

Prayer was, by Mohammed, thought ſo neceſſary a duty, that he uſed to call it *the pillar of religion*, and *the key of paradiſe*; and when the Thakifites, who dwelt at Tayef, ſending, in the ninth year of the Hejra, to make their ſubmiſſion to that prophet, after the keeping of their favourite idol had been denied them, begged, at leaſt, that they might be diſpenſed with as to their ſaying of their appointed prayers, he anſwered, *That there could be no good in that religion wherein was no prayer.*

That ſo important a duty, therefore, might not be neglected, Mohammed obliged his followers to pray five times every twenty-four hours, at certain ſtated times; *viz.* 1. In the morning, before ſun-riſe: 2. When noon is paſt, and the ſun begins to decline from the meridian: 3. In the afternoon, before ſun-ſet: 4. In the evening, after ſun-ſet, and before day be ſhut in: and, 5. After the day is ſhut in, and before the firſt watch of the night. For this inſtitution he pretended to have received the divine command from the throne of God himſelf, when he took his night-journey to heaven; and the obſerving of the ſtated times of prayer is frequently inſiſted on in the Koran, though they be not particularly preſcribed therein. Accordingly, at the aforeſaid times, of which public notice is given by the Muedhdhins, or Criers, from the ſteeples of their Moſques, (for they uſe no bells,) every conſcientious Muſſem prepares himſelf for prayer, which he performs either in the Moſque or any other place, provided it be clean, after a preſcribed form, and with a certain number of praiſes or ejaculations, (which the more ſcrupulous count by a ſtring of beads and uſing certain poſtures of worſhip;) all which have been particularly ſet down and deſcribed, though with ſome few miſtakes, by other writers, and ought not to be abridged, unleſs in ſome ſpecial caſes, as on a journey, on preparing for battle, *&c.*

For the regular performance of the duty of prayer among the Mohammedans, beſides the particulars abovementioned, it is alſo requiſite that they turn their faces, while they pray, towards the temple of Mecca; the quarter where the ſame is ſituate being, for that reaſon, pointed out within their moſques by a nich, which they call al Mehrab; and without, by the ſituation of the doors opening into the galleries of the ſteeples: there are, alſo, tables calculated for the ready finding out their Keblah, or part towards which they ought to pray, in places where they have no other direction.

The next point of the Mohammedan religion is the giving of alms; which are of two ſorts, *legal* and *voluntary*. The *legal alms* are of indiſpenſable obligation, being commanded by the law, which directs and determines both the portion which is to be given, and of what things itought to be given; but the *voluntary alms* are left to every one's liberty, to give more or leſs, as he ſhall ſee fit. The former kind of alms ſome think to be properly called Zacat, and the latter Sadakat; though this name be alſo frequently given to the legal alms. They are called Zacat, either becauſe they *increaſe* a man's ſtore by drawing down a bleſſing thereon, and produce in his ſoul the virtue of liberality; or becauſe they *purify* the remaining part of one's ſubſtance from pollution, and the ſoul from the filth of avarice; and Sadakat, becauſe they are a proof of a man's ſincerity in the worſhip of God. Some writers have called the legal alms *tithes*, but improperly, ſince in ſome caſes they fall ſhort, and in others exceed that proportion.

The third point of religious practice is faſting; a duty of ſo great moment, that Mohammed uſed to ſay it was *the gate of religion*, and that *the odour of the mouth of him who faſteth is more grateful to* God *than that of muſk*; and al Ghazali reckons faſting *one fourth part of the faith*. According to the Mohammedan divines, there are three degrees of faſting: 1. The reſtraining the belly and other parts of the body from ſatisfying their luſts; 2. The reſtraining the ears, eyes, tongue, hands, feet, and other

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ther members from ſin; and, 3. The faſting of the heart from worldly cares, and reſtraining the thoughts from every thing beſides God.

The Mohammedans are obliged, by the expreſs command of the Koran, to faſt the whole month of Ramadan, from the time the new moon firſt appears, till the appearance of the next new moon; during which time they muſt abſtain from eating, drinking, and women, from day-break till night or ſun-ſet. And this injunction they obſerve ſo ſtrictly, that, while they faſt, they ſuffer nothing to enter their mouths, or other parts of their body, eſteeming the faſt broken and null, if they ſmell perfumes, take a clyſter or injection, bathe, or even purpoſely ſwallow their ſpittle: ſome being ſo cautious, that they will not open their mouths to ſpeak, leſt they ſhould breathe the air too freely: the faſt is alſo deemed void, if a man kiſs or touch a woman, or if he vomit deſignedly. But after ſun-ſet they are allowed to refreſh themſelves, and to eat and drink, and enjoy the company of their wives till day-break; though the more rigid begin the faſt again at midnight. This faſt is extremely rigorous and mortifying when the month of Ramadan happens to fall in ſummer, (for, the Arabian year being lunar, each month runs through all the different ſeaſons in the courſe of thirty-three years) the length and heat of the days making the obſervance of it much more difficult and uneaſy than in winter.

The reaſon given why the month of Ramadan was pitched on for this purpoſe is, that on that month the Koran was ſent down from heaven. Some pretend that Abraham, Moſes, and Jeſus, received their reſpective revelations in the ſame month.

The pilgrimage to Mecca is ſo neceſſary a point of practice, that, according to a tradition of Mohammed, he who dies without performing it may as well die a Jew or a Chriſtian; and the ſame is expreſsly commanded in the Koran.

The temple of Mecca ſtands in the midſt of the city, and is honoured with the title of Masjad al elharam, i. e. *the ſacred or inviolable temple*. What is principally reverenced in this place, and gives ſanctity to the whole, is a ſquare ſtone building, called the Caaba, as ſome fancy, from its height, which ſurpaſſes that of the other buildings in Mecca; but more probably from its quadrangular form, and Beit Allah, i. e. the *houſe of* God, being peculiarly hallowed and ſet apart for his worſhip. The length of this edifice, from north to ſouth, is twenty-four cubits, its breadth from eaſt to weſt twenty-three cubits, and its height twenty-ſeven cubits: the door, which is on the eaſt ſide, ſtands about four cubits from the ground; the floor being level with the bottom of the door. In the corner next this door is *the black ſtone*. On the north ſide of the Caaba, within a ſemicircular incloſure fifty cubits long, lies the *white ſtone*, ſaid to be the ſepulchre of Iſhmael, which receives the rain water that falls off the Caaba by a ſpout, formerly of wood, but now of gold. The Caaba has a double roof, ſupported within by three octangular pillars of aloes wood; between which, on a bar of iron, hang ſome ſilver lamps. The outſide is covered with rich black damaſk, adorned with an embroidered band of gold, which is changed every year, and was formerly ſent by the Khalifs, afterwards by the Soltans of Egypt, and is now provided by the Turkiſh emperors. At a ſmall diſtance from the Caaba, on the eaſt ſide, is the *ſtation* or *place* of Abraham, where is another ſtone much reſpected by the Mohammedans, of which ſomething will be ſaid hereafter.

The Caaba, at ſome diſtance, is ſurrounded, but not entirely, by a circular incloſure of pillars joined towards the bottom by a low baluſtrade, and towards the top by bars of ſilver. Juſt without this inner incloſure, on the ſouth, north, and weſt ſides of the Caaba, are three buildings, which are the oratories or places where three of the orthodox ſects aſſemble to perform their devotions, (the fourth ſect, *viz.* that of al Shafei, making uſe of the ſtation of Abraham for that purpoſe;) and, towards the ſouth-eaſt, ſtands the edifice which covers the well Zemzem, the treaſury, and the cupola of al Abbas.

All theſe buildings are incloſed, at a conſiderable diſtance, by a magnificent piazza, or ſquare colonnade, like that of the Royal Exchange in London, but much larger, covered with ſmall domes or cupolas; from the four corners whereof riſe as many minarets or ſteeples, with double galleries, and adorned with gilded ſpires and creſcents, as are the cupolas which cover the piazza and the other buildings Between the pillars of both incloſures hang a great number of lamps, which are conſtantly lighted at night.

This is properly all that is called the temple; but, the whole territory of Mecca being alſo Haram or ſacred, there is a third incloſure diſtinguiſhed at certain diſtances by ſmall turrets, ſome five, ſome ſeven, and others ten miles diſtant from the city. Within this compaſs of ground it is not lawful to attack an enemy, or even to hunt or fowl, or cut a branch from a tree.

The temple of Mecca was a place of worſhip, and in ſingular veneration with the Arabs, from great antiquity, and many centuries before Mohammed. Though it was moſt probably dedicated at firſt to an idolatrous uſe, yet the Mohammedans are generally perſuaded that the Caaba is almoſt coeval with the world.

After this edifice had undergone ſeveral reparations, it was a few years after the birth of Mohammed rebuilt by the Koreiſh on the old foundation, and afterwards repaired by Abd'allah Ebn Zobeir, the Khalif of Mecca; and at length again rebuilt by Yuſof, ſurnamed al Hejaj, in the ſeventy-fourth year of the Hejra, with ſome alterations, in the form wherein it now remains. Some years after, however, the Khalif Harun al Raſhid (or, as others write, his father al Mohdi, or his grandfather al Manſur) intended again to change what had been altered by al Hejaj, and to reduce the Caaba to the old form in which it was left by Abd'allah; but was diſſuaded from meddling with it, leſt ſo holy a place ſhould become the ſport of princes, and, being new-modelled after every one's fancy, ſhould loſe that reverence which was juſtly paid it. But, notwithſtanding the antiquity and holineſs of this building, they have a prophecy, by tradition from Mohammed, that in the laſt times the Ethiopians ſhall come and utterly demoliſh it; after which it will not be rebuilt again for ever.

Before we leave the temple of Mecca, two or three particulars

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particulars deſerve further notice. One is the celebrated *black ſtone*, which is ſet in ſilver, and fixed in the ſouth-eaſt corner of the Caaba, being that which looks toward Baſra, about two cubits and one third, or, which is the ſame thing, ſeven ſpans from the ground. This ſtone is exceedingly reſpected by the Mohammedans, and is kiſſed by the pilgrims with great devotion, being called by ſome the *right hand of* God *on earth*. They fable, that it is one of the precious ſtones of paradiſe, and fell down to the earth with Adam, and, being taken up again, or otherwiſe preſerved at the deluge, the angel Gabriel afterwards brought it back to Abraham, when he was building the Caaba. It was at firſt whiter than milk, but grew black long ſince by the touch of a menſtruous woman, or, as others tell us, by the ſins of mankind, or rather by the touches and kiſſes of ſo many people; the ſuperficies only being black, and the inſide ſtill remaining white.

To this temple every Mohammedan, who has health and means ſufficient, ought once, at leaſt, in his life to go on pilgrimage; nor are women excuſed from the performance of this duty. The pilgrims meet at different places near Mecca, according to the different parts from whence they come, during the months of Shawal and Dhu'lkaada; being obliged to be there by the beginning of Dhu'lhajja; which month, as its name imports, is peculiarly ſet apart for the celebration of this ſolemnity.

At the place above-mentioned the pilgrims properly commence ſuch; when the men put on the Ihram or ſacred habit, which conſiſts only of two woollen wrappers, one wrapped about their middle to cover their privities, and the other thrown over their ſhoulders, having their heads bare, and a kind of ſlippers which cover neither the heel nor the inſtep, and ſo enter the ſacred territory in their way to Mecca. While they have this habit on, they muſt neither hunt nor fowl, (though they are allowed to fiſh;) which precept is ſo punctually obſerved, that they will not kill even a louſe or a flea, if they find them on their bodies: there are ſome noxious animals, however, which they have permiſſion to kill during the pilgrimage, as kites, ravens, ſcorpions, mice, and dogs given to bite. During the pilgrimage, it behoves a man to have a conſtant guard over his words and actions, and to avoid all quarrelling or ill language, and all converſe with women and obſcene diſcourſe, and to apply his whole intention to the good work he is engaged in.

The pilgrims, being arived at Mecca, immediately viſit the temple, and then enter on the performance of the preſcribed ceremonies; which conſiſt chiefly in going in proceſſion round the Caaba, in running between the mounts Safa and Merwa, in making the ſtation on mount Arafat, and ſlaying the victims, and ſhaving their heads in the valley of Mina.

In compaſſing the Caaba, which they do ſeven times, beginning at the corner where the black ſtone is fixed, they uſe a ſhort quick pace the three firſt times they go round it, and a grave ordinary pace the four laſt; which, it is ſaid, was ordered by Mohammed, that his followers might ſhew themſelves ſtrong and active, to cut off the hopes of the infidels, who gave out, that the immoderate heats of Medina had rendered them weak. But the aforeſaid quick pace they are not obliged to uſe every time they perform this piece of devotion, but only at ſome particular times. So often as they paſs by the black ſtone, they either kiſs it, or touch it with their hand, and kiſs that.

The running between Safa and Merwa is alſo performed ſeven times, partly with a ſlow pace, and partly running: for they walk gravely till they come to a place between two pillars; and there they run, and afterwards walk again; ſometimes looking back, and ſometimes ſtopping, like one who has loſt ſomething, to repreſent Hagar ſeeking water for her ſon; for the ceremony is ſaid to be as ancient as her time.

On the ninth of Dhu'lhajja, after morning prayer, the pilgrims leave the valley of Mina, whither they come the day before, and proceed in a tumultuous and ruſhing manner to mount Arafat, where they ſtay to perform their devotions till ſun-ſet: then they go to Mozdalifa, an oratory between Arafat and Mina; and there ſpend the night in prayer, and reading the Koran The next morning by day-break they viſit al Maſher al haram or the *ſacred monument*, and, departing thence before ſun-riſe, haſte by Batn Mohaſſer to the valley of Mina, where they throw ſeven ſtones at three marks or pillars, in imitation of Abraham, who, meeting the devil in that place, and being by him diſturbed in his devotions, or tempted to diſobedience, when he was going to ſacrifice his ſon, was commanded by God to drive him away by throwing ſtones at him; though others pretend this rite to be as old as Adam, who alſo put the devil to flight in the ſame place and by the ſame means.

This ceremony being over, on the ſame day, the tenth of Dhu'lhajja, the pilgrims ſlay their victims in the ſaid valley of Mina; of which they and their friends eat part, and the reſt is given to the poor. Theſe victims muſt be either ſheep, goats, kine, or camels; males, if of either of the two former kinds; and females, if of either of the latter; and of a fit age. The ſacrifices being over, they ſhave their heads and cut their nails, burying them in the ſame place; after which the pilgrimage is looked on as completed; though they again viſit the Caaba, to take their leave of that ſacred building.

MAIDEN, an inſtrument uſed in Scotland for beheading criminals.

This is a broad piece of iron, about a foot ſquare, very ſharp on the lower part, and loaded above with a very heavy weight of lead. At the time of execution it is pulled up to the top of a narrow wooden frame, about ten feet high, and as broad as the engine, with mouldings on each ſide for the maiden to ſlide in. A convenience is made about four feet from the ground, for the priſoner to lay his neck; and there is a kind of bar ſo faſtened as to keep him from ſtirring. The priſoner being thus ſecured, and the ſign given, the maiden is let looſe, which in a moment ſeparates his head from his body.

MAIDSTONE, the county-town of Kent, ſituated on the Medway, twenty-two miles weſt of Canterbury: E. long. 37′, N. lat. 51° 20′. It ſends two members to parliament.

MAJESTY,

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MAJESTY, a title given to kings, which frequently ſerves as a term of diſtinction.

Thus the emperor is called Sacred Majeſty, Imperial Majeſty, and Cæſarian Majeſty; the king of France is called his Moſt Chriſtian Majeſty, and when he treats with the emperor, the word Sacred is added; and the king of Spain is termed his Moſt Catholic Majeſty: with reſpect to other kings, the name of the kingdom is added, as his Britannic Majeſty, his Poliſh Majeſty, *&c.* Formerly princes were more ſparing in giving titles, and more modeſt in claiming them: before the reign of Charles V. the kings of Spain had only the title of Highneſs; and before that of Henry VIII. the kings of England were only addreſſed under the title of Grace and Highneſs.

MAIL, or *coat of* MAIL, a piece of defenſive armour for the body, made of ſmall iron rings, interwoven in the manner of a net

Action of MAILS *and Duties*, in Scots law. See LAW, Tit. XXX. 20.

MAINE, a river of Germany, which riſes on the eaſt ſide of the circle of Franconia, and running from eaſt to weſt, diſcharges itſelf into the Rhine at Mentz.

MAINPRISE, in law, is the receiving a perſon into friendly cuſtody, who might otherwiſe be committed to priſon, on ſecurity given that he ſhall be forthcoming at a certain time and place appointed.

MAJOR, in the art of war, the name of ſeveral officers of very different ranks and functions; as. 1. Major-general, the next officer to the lieutenant-general: his chief buſineſs is to receive the orders from the general, or in his abſence from the lieutenant-general of the day; which he is to diſtribute to the brigade-majors, with whom he is to regulate the guards, convoys, and detachments. When there are two attacks at a ſiege, he commands that on the left. He ought to be well acquainted with the ſtrength of each brigade, of each regiment in particular, and to have a liſt of all the field officers. In ſhort, he is in the army what a major is in a regiment. He is allowed an aid de camp, and has a ſerjeant and fifteen men for his guard. 2. Major of a brigade, the officer who receives the orders from the major-general, and afterwards delivers them to the adjutants of the regiments at the head of the brigade; where he takes and marches the detachments, *&c* to the general rendezvous. He ought to be an expert captain, to know the ſtate and condition of the brigade, and keep a roll of the colonels, lieutenant-colonels majors, and adjutants 3. Major of a regiment, the next officer to the lieutenant colonel, generally promoted from the oldeſt captain. He is to take care that the regiment be well exerciſed, to ſee it march in good order, and to rally it in caſe of its being broke. He is the only officer among the foot that is allowed to be on horſeback in time of action, that he may the more readily execute the colonel's orders, either in advancing or drawing off the regiment. 4. Major of a regiment of horſe, is the firſt captain, who commands in the abſence of the colonel. 5. Town-major, the third officer in a garriſon, being next to the deputy-governor. He ought to underſtand fortification, and hath charge of the guards, rounds, patrols, *&c.* His buſineſs is alſo to take care that the ſoldiers arms are in good order; he likewiſe orders the gates to be opened and ſhut, and gives the governor an account of all that paſſes within the place.

There are alſo aids-major, drums-major, *&c.* ſo called from their preheminence above others of the ſame denomination.

MAJOR, in logic, the firſt propoſition of a ſyllogiſm. See LOGIC.

MAJORANA, in botany. See ORIGANUM.

MAJORCA, the capital of a Spaniſh iſland of the ſame name: E. long. 2° 30′, N. lat 39° 30′.

This iſland is in the Mediterranean ſea, about ſixty miles long, and forty five broad, ſituated about eighty miles ſouth of the coaſt of Catalonia, and an hundred miles eaſt of Valencia.

MAIRE, or *ſtreights of Le* MAIRE, is a paſſage to Cape Horn, ſituated between Terra del Fuego in South America, and Statten iſland; which being diſcovered by Le Maire, obtained his name.

MAIZ. See ZEA.

MALA, the cheek, in anatomy. See ANATOMY, p. 160.

MALABAR, the ſouth-weſt coaſt of the peninſula of hither India, about 400 miles long, and 100 broad, bounded by Viſapour on the north by the mountains of Baligate, on the eaſt; and by the Indian ocean on the weſt and ſouth.

MALACCA, the moſt ſoutherly part of the farther peninſula of India, about 600 miles long, and generally about 200 miles broad; bounded by Siam, on the north; by the bay of Siam and the Indian ocean, on the eaſt; and by the ſtreights of Malacca, on the ſouth-weſt. The capital of this country, which is alſo commonly called Malacca, is ſituated in 100° of E. long. and 2° 30′ N. lat.

MALACHI, or *the prophecy of* MALACHI, a canonical book of the old Teſtament, and the laſt of the twelve leſſer prophets. Malachi propheſied about three hundred years before Chriſt, reproving the Jews for their wickedneſs after their return from Babylon, charging them with rebellion, ſacrilege, adultery, prophaneneſs, and infidelity, and condemning the prieſts for being ſcandalouſly careleſs in their miniſtry: at the ſame time not forgetting to encourage the pious few, who, in that corrupt age, maintained their integrity. This prophet diſtinctly points at the Meſſiah, who was ſuddenly to come to his temple, and to be introduced by Elijah the prophet, that is, by John the Baptiſt, who came in the ſpirit and power of Elias or Elijah.

MALACIA, in medicine, is a languiſhing diſorder incident to pregnant women, in which they long ſometimes for one kind of food, and ſometimes for another, and eat it with an extraordinary greedineſs.

MALACOPTERYGIOUS, among ichthyologiſts, an appellation given to ſuch fiſhes as have the rays of their fins bony, but not pointed or ſharp at the extremities, like thoſe of acanthopterygious fiſhes.

MALACOSTOMOUS FISHES, thoſe deſtitute of teeth in the jaws, called in Engliſh leather-mouthed; as the tench, carp, bream, *&c.*

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MALAGA, a city and port of Spain, in the province of Granada, ſituated in the Mediterranean, ſixty-ſix miles north-eaſt of Gibraltar: W. long. 4° 45′, N. lat. 36° 40′.

MALAGMA, a cataplaſm. See CATAPLASM.

MALAMOCCA, a ſmall iſland and port-town in the lagunes of Venice, ſituated five miles ſouth of that city.

MALDIVA-ISLANDS, are about a thouſand ſmall iſlands in the Indian ocean, 500 miles ſouth-weſt of the continent of the hither India, extending from the ſecond degree of ſouth latitude, to the ſeventh degree of north latitude.

MALDON, a port-town of Eſſex, ten miles eaſt of Chelmsford. It ſends two members to parliament.

MALE, among zoologiſts, that ſex of animals which has the parts of generation without the body.

MALIGNANT, among phyſicians, a term applied to diſeaſes of a very dangerous nature, and generally infectious: ſuch are the dyſentery, hoſpital-fever, *&c.* in their worſt ſtages.

MALL, or SEA-MALL, in ornithology. See LARUS,

MALLEABLE, a property of metals, whereby they are capable of being extended under the hammer.

MALLEUS, in anatomy. See ANATOMY, p. 297.

MALLOW, in botany. See MALVA.

MALMSBURY, a borough-town of Wiltſhire, thirty miles ſouth-weſt of Saliſbury: it ſends two members to parliament.

MALO, or *St* MALO, a city and port-town of France, in the province of Britany, ſituated on a rock, in the Engliſh channel, but joined to the continent by a cauſeway: W. long. 2°, N. lat. 48° 40′.

MALOPE, in botany, a genus of the monadelphia polyandria claſs. It has a double calix, the exterior one having three leaves; and the capſule contains but one ſeed. There is only one ſpecies, a native of Mauritania.

MALPIGHIA, in botany, a genus of the decandria trigynia claſs. The calix conſiſts of five leaves, and the corolla of five roundiſh petals; and the berry has one cell and three ſeeds. There are nine ſpecies, none of them natives of Britain.

MALPLAQUET, a village in the Auſtrian Netherlands, in the province of Hainault, about ſeven miles from Mons.

MALT. See BREWING.

MALTA, the capital of a ſmall iſland of the ſame name in the Mediterranean, is ſituated in E. long. 15°, N. lat. 35° 15′; conſiſting of three towns, ſeparated by channels, which form ſo many peninſulas of ſolid rock, riſing a great height above the ſea.

Knights of MALTA, otherwiſe called *Hoſpitalers of St. John of Jeruſalem*, a religious military order, whoſe reſidence is in the iſland of Malta. The order conſiſts of three eſtates, the knights, chaplains, and ſervants at arms: there are alſo prieſts who officiate in the churches; friar-ſervants, who aſſiſt at the offices; and donnes, or demicroſſes; but theſe are not reckoned conſtituent parts of the body. The government of the order is mixt, being partly monarchical, and partly ariſtocratical: the grand maſter is ſovereign. The knights formerly conſiſted of eight different languages, but now only ſeven, the Engliſh having withdrawn themſelves. None are admitted into this order but ſuch as are of noble birth: the knights are of two ſorts, thoſe who have a right to be candidates for the dignity of grand maſter, called grand croſſes, and thoſe who are only knights aſſiſtants: they never marry, yet have continued from 1090 to the preſent time. The knights are received into this order, either by undergoing the trials preſcribed by ſtatutes, or by diſpenſation.

MALTON, a borough of Yorkſhire, ſituated on the river Derwent, twenty miles north-eaſt of York. It ſends two members to parliament.

MALVA, in botany, a genus of the monadelphia polyandria claſs. The calix is double, the exterior one conſiſting of three leaves; and there are many capſules, containing each one ſeed. There are 22 ſpecies, five of them natives of Britain, *viz.* the ſylveſtris, or common mallow; the rotundifolia, or dwarf mallow; the parviflora, or ſmall flowered mallow; the alcea, or vervain mallow; and the moſchata, or jagged-leaved vervain mallow. The leaves of the mallow are emollient.

MALUS, in botany. See PYRUS.

MAMALUKES, the name of a dynaſty that reigned in Egypt.

The Mamalukes were originally Turkiſh and Circaſſia ſlaves, bought of the Tartars by Melicſaleh, to the number of a thouſand, whom he bred up to arms, and raiſed ſome to the principal offices of the empire. They killed ſultan Moadam, to whom they ſucceeded.

Others ſay, that the mamalukes were ordinarily choſen from among the Chriſtian ſlaves, and that they were the ſame thing in a great meaſure with the Janiſſaries among the Turks. They never married. They firſt are ſaid to have been brought from Circaſſia, and ſome have ſuppoſed that they began to reign about the year 869.

MAMMÆ, in anatomy. See ANATOMY, p. 277.

MAMMEA, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of four petals, and the calix of two leaves; and the berry is large, and contains four ſeeds. There are two ſpecies, none of them natives of Britain.

MAN, in zoology. See HOMO.

MANCHESER, a large town of Lancaſhire, forty miles ſouth-eaſt of Lancaſter.

MANDAMUS, in law, a writ that iſſues out of the court of king's bench, ſent to a corporation, commanding them to admit or reſtore a perſon to his office.

MANDARINS, a name give to the magiſtrates and governors of provinces in China, who are choſen out of the moſt learned men, and whoſe government is always at a great diſtance from the place of their birth. Mandarin is alſo a name given by the Chineſe to the learned language of the country; for beſides the language peculiar to every province, there is one common to all the learned in the empire, which is in China what Latin is in Europe; this is called the mandarin tongue, or the language of the court.

MANDATE, in law, a judicial commandment to do ſomething. See MANDAMUS.

MANDATE, in Scots law. See LAW, Tit. xxii. 9.

MAN-

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MANDERSCHEIT, a city of Germany, in the electorate of Triers, and the capital of the county of Manderſcheit: E. long. 6° 32′, N. lat. 50° 20′.

MANDRAGORA, in botany. See ATROPA.

MANE, the hair hanging down from a horſe's neck; which ſhould be long, thin, and fine; and if frizzled, ſo much the better.

MANEGE, or MANAGE, the exerciſe of riding the great horſe, or the ground ſet apart for that purpoſe; which is ſometimes covered, for continuing the exerciſe in bad weather; and ſometimes open, in order to give more liberty and freedom both to the horſeman and horſe. See HORSEMANSHIP.

MANES, in the pagan ſyſtem of theology, a general name for the infernal deities, or gods of hell.

The ancients comprehended under manes not only Pluto, Proſerpine, and Minos, but the ſouls likewiſe of the deceaſed were taken into the number, and eſteemed gods of hell. It was uſual to erect altars and offer libations to the manes of deceaſed friends and relations. One branch of the magic art among the pagans conſiſted in conſulting the manes of the dead in matters of importance: this was called Necromancy. See NECROMANCY.

MANGIFERA, in botany, a genus of the pentandria monogynia claſs. The corolla conſiſts of five petals; and the drupa is ſhaped like a kidney. There is but one ſpecies a native of Britain.

MANHEIM, a city of Germany, in the palatinate of the Rhine, ſituated at the confluence of the Rhine and Neckar: E. long. 7° 20′, N. lat. 49° 30′.

MANIA, in medicine. See MEDICINE.

MANICHEES, in church-hiſtory, a ſect of Chriſtian heretics in the third century, the followers of Manes, who made his appearance in the reign of the emperor Probus; pretending to be the comforter whom our Savious promiſed to ſend into the world. He taught that there are two principles, or gods, coeternal and independant on each other, the one the author of all evil, and the other of all good; a doctrine which he borrowed from the Perſian magi. He held that our ſouls we made by the good principle, and our bodies by the evil one; and that the ſouls of his followers paſſed through the elements to the moon, and from thence to the ſun; where being purified, they then went to God, and became united with his eſſence; but as for the ſouls of other men, they either went to hell, or were united to other bodies. He alledged, that Chriſt had his reſidence in the ſun, the Holy Ghoſt in the air, wiſdom in the moon, and the Father in the abyſs of light. He is alſo charged with denying the reſurrection and condemning marriage; with teaching that Chriſt was the ſerpent that tempted Eve; with forbidding the uſe of eggs, cheeſe, milk, and wine, as proceeding from the bad principle; with uſing a different kind of baptiſm from that of the church; with teaching that magiſtrates were not to be obeyed; and with condemning the moſt lawful wars.

MANICORDON, or MANICHORD, a muſical inſtrument in the form of a ſpinet; the ſtrings of which, like thoſe of the clarichord, are covered with little pieces of cloth, to deaden was well as to ſoften their ſound; whence it is alſo called the dumb ſpinet.

MANIFESTO, a public declaration made by a prince in writing, ſhewing his intentions to begin a war, or other enterprize, with the motives that induce him to it, and the reaſons on which he founds his rights and pretenſions.

MANILLE, in commerce, a large braſs ring in the form of a bracelet, either plain or engraven, flat or round.

Manilles are the principal commodities which the Europeans carry to the coaſt of Africa, and exchange with the natives for ſlaves. Theſe people wear them as ornaments on the ſmall of the leg, and on the thick part of the arm above the elbow. The great men wear manilles of gold and ſilver, but theſe are made in the country by the natives themſelves.

MANIPULUS, in Roman antiquity, a body of infantry, conſiſting of two hundred men, and conſtituting the third part of a cohort.

MANIS, the SCALY LIZARD, in zoology, a genus of quadrupeds, belonging to the order of Bruta, the characters of which are theſe: They have no fore-teeth either in the upper or under jaw; the tongue is long and cylindrical: the ſnout is long and narrow; and the body is covered with hard ſcales. There are two ſpecies, *viz.*

1. The pentadactyla, or ſcaly lizard with five toes on each foot. The head is ſmaller than the neck; the eyes are very ſmall; the length of the body, including the tail, is from ſix to eight feet. The whole body is covered with hard ſcales, excepting the under part of the head and neck, the breaſt, the belly, and the internal ſide of each leg. Betwixt the ſcales of this animal, there are ſome hard hairs like the briſtles of a hog, browniſh at the points. The ſcales are of a reddiſh colour, very hard, convex above, and concave below. All the parts which want ſcales are naked. The ſcales are unconnected, and the animal can raiſe or lower them at pleaſure like the quills of the porcupine. When irritated, he erects his ſcales, and rolls himſelf up like a hedge-hog. In this ſituation, neither the tiger, the lion, nor any other animal, is able to hurt him. This creature has nothing forbidding about him but his figure. He is mild and inoffenſive, feeding on nothing but worms and other inſects. His motion is ſlow; and he has no other method of eſcaping the purſuit of man, but by concealing himſelf in crannies of rocks, and in holes which they dig in the ground, where they likewiſe bring forth their young. This animal is a native of the Eaſt Indies; and are ſo few in number, that they are ſeldom to be met with.

2. The tetradactyla, or ſcaly lizard with four toes on each foot. This ſpecies is very ſimilar to the former; only the tail is much longer in proportion to the body, and ſuch parts as want ſcales, inſtead of being naked, are covered with a ſoft hair. It is likewiſe found in the Eaſt Indies. See Plate CIV fig. 4.

MANNA, in the materia medica, the concreted juice of ſome vegetable, naturally exſudating from it, ſoluble in water, and not inflammable.

It is a honey-like juice, brought to us from Calabria and

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and Sicily, ſometimes in ſmall granules, or drops of an irregular figure, roundiſh, oblong, crooked, and ſometimes contorted. It ſhould be choſen whitiſh, or at the utmoſt with only a faint caſt of yellow, not too heavy, in regular dry granules, or in moderately long ſtriæ or flakes, of a pleaſant taſte, and diſſolving wholly in the mouth, not leaving a farinaceous ſubſtance behind it, as much of the common manna does that has been adulterated with honey and flour.

Manna is the mildeſt and ſafeſt of all purges, and may be given to children, to women with child, and to people of the moſt tender conſtitutions, with perfect ſafety; and it never fails gently to move the bowels.

MANOR, an ancient royalty or lordſhip, formerly called a barony, conſiſting of demeſnes, ſervices, and a court-baron; and comprehending in it meſſuages, lands, meadow, paſture, wood, rents, an advowſon, *&c.* It may contain one or more villages or hamlets, or only a great part of a village, *&c.*

MANS, the capital of the territory of Maine, in the province of Orleanois in France: E. long. 5′, N. lat. 48° 6′.

MANSFIELD, a city of Germany, the capital of a county of the ſame name, in the circle of Upper Saxany: E. long. 11° 45′. N. lat. 51° 36′.

MANSION, in law, is the chief dwelling houſe of a lord within his fee, or the capital meſſuage or manor-houſe.

MANSLAUGHTER, generally termed homicide, is killing a perſon without premeditated malice.

MANTELETS, in the art of war, a kind of moveable parapets, made of planks about three inches thick, nailed one over another, to the height of almoſt ſix feet, generally caſed with tin, and ſet upon little wheels, ſo that in a ſiege they may be driven before the pioneers, and ſerve as blinds to ſhelter them from the enemy's ſmall ſhot.

MANTLE, or MANTLE-TREE, in architecture, the lower part of the chimney, or that piece of timber which is laid acroſs the jaumbs, and ſuſtains the compartment of the chimney-piece.

MANTLE, or MANTLING, in heraldry, that appearance of folding of cloth, flouriſhing, or drapery, that is in any atchievement drawn about the coat of arms. It is ſuppoſed originally to be the repreſentation of a mantle, or military habit, worn by the ancient cavaliers over their armour to preſerve it from ruſt; or, as others hold, a ſhort covering only worn over the helmet, which in after-times was lengthened, and made to hang from the helmet below the whole ſhield. See Plate CX. fig 1.

MANTUA, the capital of a duchy of the ſame name in Italy, is ſituated in the middle of a lake, formed by the river Mincio, but has a communication with the continent by three cauſeways: E. long. 11° 15′, N. lat. 45° 20′.

MANUMISSION, in Roman antiquity, the act of ſeting a ſlave at liberty; which was uſually performed before the prætor, who laid his wand, called vindicta, on the ſlave's head, and declared him free.

MANUFACTURER, one who works up a natural product into an artificial commodity.

MANURE, any thing uſed for fattening and improving land. See AGRICULTURE, p. 47.

MANUSCRIPT, in matters of literature, denotes a written book, in contradiſtinction to a printed one. See BOOK.

MAP, a plain figure, repreſenting the ſurface of the earth, or a part thereof, according to the laws of perſpective. See GEOGRAPHY.

MAPLE, in botany. See ACER.

MAPPARIUS, in Roman antiquity, the officer who gave the ſignal to the gladiators to begin fighting; which he did by throwing an handkerchief that he had received from the emperor or other magiſtrate.

MARANTA, in botany, a genus of the monandria monogynia claſs. The corolla is ringent, and conſiſts of five ſegments. There are two ſpecies, none of them natives of Britain.

MARASMUS, among phyſicians, denotes an atrophy or conſumption, in its laſt and moſt deplorable ſtage.

MARBLE, in natural hiſtory, a genus of foſſils; being bright and beautiful ſtones, compoſed of ſmall ſeparate concretions moderately hard, not giving fire with ſteel, fermenting with and ſoluble in acid menſtrua, and calcining in a ſlight fire.

The colours of marbles being a very obvious and ſtriking character they are arranged according to them in the following diviſions. 1. Of the white plain marbles there are two ſorts; the Parian marble of the ancients, and ſtatuary marble of the moderns, an extremely bright and elegant marble; and the Carara marble, a very fine marble, more compact and cloſe than the former, but leſs bright. 2. Of the plain yelloviſh marbles there is only one ſort, which is a hard, pale yellow, and gloſſy marble, found in many parts of Italy. 3. Of the bluiſh and black marbles there are a great many ſpecies, as the China marble, baſaltes, *&c.* 4. Of the plain green marbles there is only one kind, the Lacedemonian marble of the ancients. 5. The pale coloured or whitiſh brown, commonly called Darby-marble. 6. The green marbles with ſhells 7. The black coralloide marble, with and without ſhells. 8. Of the white variegated marbles there are a great many ſpecies, variegated with purple, brown, red, blue, *&c* 9. Of the brown variegated marbles there are likewiſe ſeveral ſorts, ſome with red veins, others with white, black, or brown veins. 10 Of the yellow-veined and variegated marbles, ſome are veined with purple, and others with blue. 11. Of the black variegated marbles, ſome are veined with white, and others with blue, yellow, red, *&c.* 12. The green variegated marbles are likewiſe diſtinguiſhed by the colour of their veins. 13. The gray ſpotted marbles are variegated, ſome with black, and others with green ſpots. 14. The red variegated marble is the brocatello of the Italians, with white and gold veins.

Colouring of MARBLE. The colouring of marbles is a nice art; and in order to ſucceed in it, the pieces of marble on which the experiments are tried muſt be well poliſhed, and clear from the leaſt ſpot or vein. The harder the marble is, the better it will bear the heat neceſſary in the operation; therefore alabaſter, and

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and the common ſoft white marble, are very improper to perform theſe operations upon.

Heat is always neceſſary for the opening the pores of the marble, ſo as to render it fit to receive the colours: but it muſt never be made red hot; for then the texture of the marble itſelf is injured, and the colours are burnt, and loſe their beauty. Too ſmall a degree of heat is as bad as too great; for, in this caſe, tho' the marble receive the colour, it will not be fixed in it, nor ſtrike deep enough. Some colours will ſtrike, even cold; but they are never ſo well ſunk in as when a juſt degree of heat is uſed. The proper degree is that which, without making the marble red, will make the liquor boil upon its ſurface. The menſtruums uſed to ſtrike in the colours muſt be varied according to the nature of the colour to be uſed. A lixivium made with horſe's or dog's urine, with four parts quick lime, and one part pot-aſhes, is excellent for ſome colours; common lye of wood-aſhes does very well for others: for ſome, ſpirit of wine is beſt; and finally, for others, oily liquors, or common white-wine

The colours which have been found to ſucceed beſt with the peculiar menſtruums, are theſe: ſtone-blue diſſolved in ſix times the quantity of ſpirit of wine, or of the urinous lixivium; and that colour which the painters call litmous, diſſolved in common lye of wood-aſhes An extract of ſaffron, and that colour made of buckthorn-berries, and called by the painters ſap-green, both ſucceed well diſſolved in urine and quick-lime, and tolerably well in ſpirit of wine. Vermillion, and a fine powder of cochineal, ſucceed alſo very well in the ſame liquors. Dragon's blood ſucceeds very well in ſpirit of wine, as does alſo a tincture of logwood in the ſame ſpirit Alkanet root gives a fine colour, but the only menſtruum to be uſed for this is oil of turpentine; for neither ſpirit of wine, nor any lixivium will do with it. There is another kind of ſanguis draconis, called dragon's blood in tears, which, mixed with urine alone, gives a very elegant colour. Beſides theſe mixtures of colours and menſtruums, there are ſome colours which are to be laid on dry and unmixed. Theſe are dragon's blood, of the pureſt kind, for a red; gamboge for a yellow; green wax for a green; common brimſtone, pitch, and turpentine, for a brown colour The marble, for theſe experiments, muſt be made conſiderably hot, and then the colours are to be rubbed on dry in the lump. Some of theſe colours, when once given, remain immutable; others are eaſily changed or deſtroyed. Thus the red colour given by dragon's blood, or by a decoction of logwood, will be wholly taken away by oil of tartar, and the poliſh of the marble not hurt by it.

A fine gold colour is given in the following manner: take crude ſal armoniac, vitriol, and verdegreaſe, of each equal quantities: white vitriol ſucceeds beſt; and all muſt be thoroughly mixed in fine powder.

The ſtaining of marble to all the degrees of red or yellow, by ſolutions of dragon's blood or gamboge, may be done by reducing theſe gums to powder, and grinding them, with the ſpirit of wine, in a glaſs mortar; but for ſmaller attempts, no method is ſo good as the mixing a little of either of theſe powders with ſpirit of wine in a ſilver ſpoon, and holding it over burning charcoal By this means a fine tincture will be extracted; and with a pencil dipped in this, the fineſt traces may be made on the marble while cold, which, on the heating it afterwards, either on ſand, or in a baker's oven, will all ſink very deep, and remain perfectly diſtinct in the ſtone. It is very eaſy to make the ground colour of the marble red or yellow by this means, and leave white veins in it. This is to be done by covering the places where the whiteneſs is to remain with ſome white paint, or even with two or three doubles only of paper, either of which will prevent the colour from penetrating in that part. All the degrees of red are to be given to marble by means of this gum alone; a ſlight tincture of it, without the aſſiſtance of heat to the marble, gives only a pale fleſh colour, but the ſtronger tinctures give it yet deeper; to this the aſſiſtance of heat adds yet greatly; and finally, the addition of a little pitch to the tincture gives it a tendency to blackneſs, or any degree of deep red that is deſired. A blue colour may be given alſo to marble by diſſolving turnſol in a lixivium of lime and urine, or in the volatile ſpirit of urine; but this has always a tendency to purple, whether made by the one or the other of theſe ways. A better blue, and uſed in an eaſier manner, is furniſhed by the Canary turnſol, a ſubſtance well known among the dyers; this needs only to be diſſolved in water, and drawn on the place with a pencil: this penetrates very deep into the marble, and the colour may be increaſed by drawing the pencil wetted afreſh ſeveral times over the ſame lines. This colour is ſubject to ſpread and diffuſe itſelf irregularly; but it may be kept in regular bounds, by circumſcribing its lines with beds of wax, or any other ſuch ſubſtance.

Poliſhing of MARBLES is performed by firſt rubbing them well with a free-ſtone, or ſand till the ſtrokes of the axe are worn off then with pumice ſtone, and afterwards with emery.

Arundel-MARBLES, ancient marbles with a chronicle of the city of Athens inſcribed on them, many years before our Saviour's birth; preſented to the univerſity of Oxford by Thomas earl of Arundel whence the name.

MARBLING, in general, the painting any thing with veins and clouds, ſo as to repreſent thoſe of marble.

Marbling of books or paper is performed thus: Diſſolve four ounces of gum arabic into two quarts of fair water; then provide ſeveral colours mixed with water in pots or ſhells, and with pencils peculiar to each colour, ſprinkle them by way of intermixture upon the gum-water, which muſt be put into a trough or ſome broad veſſel; then with a ſtick curl them, or draw them out in ſtreaks, to as much variety as may be done. Having done this, hold your book or books cloſe together, and only dip the edges in, on the top of the water and colours very lightly; which done, take them off, and the plain impreſſion of the colours in mixture will be upon the leaves; doing as well the ends as the front of the book in the like manner.

After the ſame manner you may make marbled pa-

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per, by dipping it on the flat, as alſo linnen cloth, *&c.*

Marbling a book on the covers is performed by forming clouds with aqua fortis, or ſpirit of vitriol mixed with ink, and afterwards glazing the covers,

MARCASITES, in natural hiſtory, are defined to be compound inflammable metallic bodies, of a hard and ſolid ſubſtance, of an obſcurely and irregularly foliaceous ſtructure, of a bright glittering appearance, naturally conſtituting whole ſtrata, though ſometimes found in detached maſſes; very freely giving fire with ſteel; not fermenting with acid menſtruums; and when put into the fire, yielding a blue ſulphureous flame, and afterwards calcining into a purple powder. There are only three known ſpecies of this genus: 1. The ſilver-coloured marcaſite, found in vaſt abundance in lead and tin mines. 2 The gold coloured marcaſite. 3. The heavy pale-white marcaſite.

Marcaſites were at firſt ſuppoſed to be almoſt all pure gold or ſilver, according to their colour; but experience has ſhewn, that if they contain any metal at all, no method has hitherto been found of working them to advantage. In Germany, indeed, they extract ſulphur and vitriol from the ſilver marcaſite, which two ſubſtances are always contained in it; and beſides theſe, it has uſually a quantity of arſenic. It has been recommended as a ſtyptic, after being calcined: but as the arſenic may not be all carried off by that operation, its uſe as a medicine ſeems extremely dangerous.

MARCGRAVE, or MARGRAVE, a degree of honour in Germany anſwering to our marquis.

MARCGRAVIA, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of one petal, and the calix conſiſts of ſix imbricated leaves; and the berry has one cell, containing many ſeeds. There is but one ſpecies, a native of America.

MARCH, in chronology, the third month of the year, conſiſting of thirty-one days.

MARCHANTIA, in botany, a genus of the cryptogamia algæ claſs. The calix of the male is peltated, and covered below with monopetalous corollæ; the calix of the female is ſeſſile, bell-ſhaped, and contains many ſeeds. There are eight ſpecies, four of them natives of Britain, viz. the polymorphia, or common marchantia; the cruciata, or croſs-headed marchantia; the hemiſphærica, or marſh marchantia; and the conica, or wart marchantia.

MARCHE, a territory of Lyonois, in France, having Berry on the north, Burbonois and Auvergne on the eaſt, Limoſin on the ſouth, and Poictou on the weſt.

MARCHPURG, a town of Germany, in the circle of Auſtria and duchy of Stiria: W. long. 15° 50′, N. lat. 47°.

MARCIONITES, Chriſtian heretics in the IId century, thus denominated from their leader Marcion, who maintained, that there were two principles or gods, a good and a bad one.

MARCOSIANS, a ſect of Chriſtian heretics in the IId century, ſo called from their leader Marcus, who repreſented the ſupreme God as conſiſting not of a trinity, but a quaternity, *viz.* the ineffable, ſilence, the father, and truth.

MARE, the female of the horſe kind. See EQUUS.

MARGARETTA, one of the largeſt of the Leeward-iſlands; it is about fifty miles long, and twenty-four broad, and ſituated ſixty miles north of the continent of Paria, or New Andaluſia, in South America: W. long. 64°, and N. lat. 11° 30′.

MARGARITA, the PEARL, in natural hiſtory. See PEARL.

MARGATE, a port-town of Kent, in the iſle of Thanet, 12 miles north of Deal.

MARIGNAN, a city and port-town of Brazil, the capital of the captainſhip of Marignan, ſituated at the mouth of the river St Mary: W. lon. 44°, and S. lat. 2° 15′.

MARINER, the ſame with ſailor. See SAILOR.

MARINO, a city of Italy, in the duchy of Urbino, the capital of the territory of Marino, a little ſtate or commonwealth, ſituated on a mountain in the middle of the Pope's territories: E. long. 13° 30′, and N. lat. 44°.

MARJORAM, in botany. See ORIGANUM.

MARITIME, ſomething related to, or bounded by the ſea: thus, a maritime province, or country, is one bounded by the ſea; and a maritime kingdom, or ſtate, is one that makes a conſiderable figure, or is very powerful at ſea. Hence, by maritime powers, among the European ſtates, are underſtood Great Britain and Holland.

St MARK *the evangeliſt's day*, a feſtival of the Chriſtian church, obſerved April 25.

St MARK's *Goſpel*, a canonical book of the New Teſtament, being one of the four goſpels.

St Mark wrote his goſpel at Rome, where he accompanied St Peter, in the year of Chriſt 44. Tertullian and others pretend that St Mark was no more than an amanuenſis to St Peter, who dictated this goſpel to him; others affirm, that he wrote it after St Peter's death. Nor are the learned leſs divided as to the language this goſpel was wrote in; ſome affirming it was compoſed in Greek, others in Latin. Several of the ancient heretics received only the goſpel of St Mark: others among the catholics rejected the twelve laſt verſes of this goſpel. The goſpel of St Mark is properly an abridgment of that of St Matthew.

Canons of St MARK, a congregation of regular canons, founded at Mantua, by Albert Spinola a prieſt, towards the end of the XIIth century. Spinola made a rule for them, which was approved, corrected, and confirmed by ſeveral ſucceeding popes. About the year 1450, they were reformed, and followed only the rule of St Auguſtine. This congregation having flouriſhed for the ſpace of four hundred years, declined by little and little, and is now become extinct.

Knights of St MARK, an order of knighthood in the republic of Venice, under the protection of St Mark the evangeliſt. The arms of the order are, gules, a lion winged, or, with this device, PAX TIBI MARCE EVANGELISTA. This order is never conferred but on thoſe

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thoſe who have done ſignal ſervice to the commonwealth.

MARK, or MARC, alſo denotes a weight uſed in ſeveral ſtates of Europe, and for ſeveral commodities, eſpecially gold and ſilver. In France, the mark is divided into 8 ounces, or 64 drachms, or 192 derniers or penny weights, or 160 eſterlines, or 300 maills, or 640 ſelins, or 4608 grains. In Holland the mark-weight is alſo called troy weight, and is equal to that of France. When gold and ſilver are ſold by the mark, it is divided into 25 carats.

MARK is alſo uſed among us for a money of account, and in ſome other countries for a coin.

The Engliſh mark is two thirds of a pound ſterling, or 13s. 4d. and the Scotch mark is of equal value in Scotch money of account.

MARKET, a public place in a city or town, in which live cattle, proviſions, or other goods, are ſet to ſale; and alſo a privilege, either by grant or preſcription, by which a town is enabled to keep a market.

MARLBRO, or MARLBOROUGH, a borough-town of Wiltſhire, eighteen miles north of Saliſbury.

It ſends two members to parliament.

MARLBRO'-FORT, an Engliſh factory on the weſt coaſt of the iſland of Sumatra, three miles eaſt of Bencoolen: E. long. 101°, and S. lat. 4° 15′.

MARLE. See AGRICULTURE, p. 48.

MARLOW, a borough-town of Buckinghamſhire, fifteen miles ſouth of Aileſbury, It ſends two members to parliament.

MARMALADE, a confection of plumbs, apricots, quinces, *&c.* boiled with ſugar to a conſiſtence.

MARMOR. See MARBLE.

MARMORA, a little iſland of Turky, ſituated in the ſea of Marmora, to which it gives name, lying ſixty miles ſouth-weſt of Conſtantinople.

MARMOTTE, in zoology. See MUS.

MAROSCH, or MERISH, a great river, which, riſing in the Carpathian mountains, runs through Tranſilvania and Hungary, and falls into the river Teyſe at Segedin.

MARPURG, a city of Germany, forty miles north of Francfort: E. long. 8°, 40′, and N. lat. 50° 40′.

MARQUE, or *letters of* MARQUE, in military affairs, are letters of repriſal, granting the ſubjects of one prince or ſtate liberty to make repriſals on thoſe of another.

Letters of marque among us, are extraordinary commiſſions granted by authority for reparation to merchants, taken and diſpoiled by ſtrangers at ſea; and repriſals is only the retaking, or taking of one thing for another.

MARQUETRY, or INLAID-WORK, is a curious work compoſed of ſeveral fine hard pieces of wood, of various colours, faſtened in thin ſlices on a ground, and ſometimes enriched with other matters, as ſilver, braſs, tortoiſe-ſhell, and ivory: with theſe aſſiſtances the art is now capable of imitating any thing; whence it is by ſome called the art of painting in wood.

MARQUIS, a title of honour, next in dignity to that of duke, firſt given to thoſe who commanded the marches, that is, the borders and frontiers of countries.

MARR, that part of Aberdeenſhire ſituated between the rivers Dee and Don.

MARRIAGE, a contract both civil and religious, between a man and a woman, by which they engage to live together in mutual love and friendſhip, for the ends of procreation, *&c.* See LAW, Tit. vi.

The Romans, as well as the Greeks, diſallowed of polygamy. A Roman might not marry any woman who was not a Roman. It was thought diſhonourable for a woman to marry twice.

We find but few laws in the books of Moſes concerning the inſtitution of marriage: he reſtrained the Iſraelites from marrying within certain degrees of conſanguinity; but we find, that polygamy, though not expreſly allowed, is however tacitely implied in the laws of Moſes: there is a particular law that obliged a man, whoſe brother died without iſſue, to marry his widow, and raiſe up children to his brother. The Hebrews purchaſed their wives, by paying down a competent dowry for them; and a man was at liberty to marry, not only in any of the twelve tribes, but even out of them, provided it was with ſuch nations as uſed circumciſion.

The ancient Chriſtian church laid ſeveral reſtraints upon her members in relation to marriage; ſuch was the rule forbidding Chriſtians to marry with infidels and heathens: another reſtraint related to the conſanguinity and affinity prohibited in ſcripture: a third was, that children under age ſhould not marry without the conſent of their parents, guardians, or next relations: and another was, that there ſhould be ſome parity of condition between the contracting parties. They not only condemned polygamy, but even reckoned it unlawful to marry after a divorce. The Romiſh church requires of the clergy perpetual abſtinence from marriage; and has advanced this inſtitution to the dignity of a ſacrament.

MARROW, in anatomy, a ſoft oleaginous ſubſtance contained in the cavity of the bones. See ANATOMY, p. 147.

MARRUBIUM, in botany, a genus of the didynamia gymnoſpermia claſs. The calix is rigid, with ten ſtreaks; and the upper lip of the corolla is bifid, linear, and erect. There are nine ſpecies, only one of them, *viz.* the vulgare, or white horehound, is a native of Britain.

MARS, in aſtronomy. See ASTRONOMY, p. 441.

MARS, among chemiſts, denotes iron, as being ſuppoſed to be under the influence of that planet. See CHEMISTRY, p. 82 and 133.

MARSEILLES, a city and port of Provence, ſituated on a fine bay of the Mediterranean, twenty-five miles north-weſt of Toulon: E. long. 5° 20′, N. lat 43° 15′.

MARSHAL, in its primary ſignification, means an officer who has the command or care of horſes; but it is now applied to officers who have very different employments, as earl marſhal, knight marſhal, or marſhal of the king's houſe, *&c.*

MARSHAL *of the king's bench*, an officer who has the cuſtody of the king's-bench-priſon in Southwark. This officer is obliged to give his attendance, and to take

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take into his cuſtody all perſons committed by that court.

MARSHAL *of the exchequer*, an officer to whom that court commits the king's debtors.

MARSHAL *of the king's hall*, an officer who has the care of placing the houſehold ſervants and ſtrangers at table, according to their quality.

MARSHAL, or MARESCHAL, of France, an officer of the greateſt dignity in the French armies. When two or more marſhals are in the army, the eldeſt commands.

MARSHALLING a coat, in heraldry, is the diſpoſal of ſeveral coats of arms belonging to diſtinct families, in one and the ſame eſcutcheon or ſhield, together with their ornaments, parts, and appurtenances.

MARSHFIELD, a market-town of Wiltſhire, thirty-miles north-weſt of Saliſbury.

MARSHMALLOW, in botany. See ALTHÆA.

MARSILEA, in botany, a genus of the cryptogamia claſs. The antheræ are four, and placed on an obtuſely conic body: the fruit is of a roundiſh figure, conſiſting of four cells, in each of which are contained ſeveral roundiſh ſeeds. There are two ſpecies, none of them natives of Britain

St MARTHA, a city and port-town of Terra Firma, in South America and the capital of the province of St Martha: W. long. 74° 30′, N. lat 11° 45′.

MARTIAL LAW, is the law of war, which entirely depends on the arbitrary power of the prince, or of thoſe to whom he has delegated it. For though the king can make no laws in time of peace without the conſent of parliament, yet in time of war he uſes an abſolute power over the army.

MARTIN, in zoology. See MUSTELA.

Cape MARTIN, a promontory of Valencia, in Spain, on the Mediterranean: it is under the meridian of London: N. lat. 38° 50′.

MARTINGALE, in the manege, a thong of leather, faſtened to one end of the girths under the belly of a horſe, and at the other end to the muſs-roll, to keep him from rearing

MARTINICO, the chief of the French Caribbee-iſlands, ſituated in 61° of weſt long and between 14° and 15° N. lat. It is ſixty miles long, but is ſcarce twenty broad in any part.

MARTLETS, in heraldry, little birds repreſented without feet, and uſed as a difference or mark of diſtinction for younger brothers, to put them in mind that they are to truſt to the wings of virtue and merit, in order to raiſe themſelves, and not their feet, they having little land to ſet their foot on See Plate CX fig. 2.

MARTYNIA, in botany, a genus of the didynamia angioſpermia claſs The calix conſiſts of five ſegments; the corolla is ringent; and the capſule is woody, with a hooked beak, two valves, and three cells. There are two ſpecies, both natives of America.

MARTYR, is one who lays down his life or ſuffers death for the ſake of his religion.

MARTYROLOGY, is a catalogue or liſt of martyrs, including the hiſtory of their lives and ſufferings for the ſake of religion.

The martyrologies draw their materials from the kalendars of particular churches, in which the ſeveral feſtivals dedicated to them are marked; and which ſeem to be derived from the practice of the ancient Romans, who inſerted the names of heroes and great men in their faſti, or public regiſters.

The martyrologies are very numerous, and contain many ridiculous and even contradictory narratives; which is eaſily accounted for, if we conſider how many forged and ſpurious accounts of the lives of ſaints and martyrs appeared in the firſt ages of the church, which the legendary writers afterwards adopted without examining into the truth of them. However, ſome good critics, of late years, have gone a great way towards clearing the lives of the ſaints and martyrs from the monſtrous heap of fiction they laboured under.

MARVEL *of Peru*, in botany. See MIRABILIS.

MARY MAGDALEN's DAY, a feſtival of the Romiſh church, obſerved on the twenty-ſecond of July.

MARYGOLD. See CALTHA.

Corn MARYGOLD. See CHRYSANTHEMUM.

French MARYGOLD, in botany. See TAGETES.

MARYLAND, one of the Britiſh plantations in North America, ſituated between 74° and 78° W long. and between 38° and 40° N lat.

MASCULINE, or MASCULINE GENDER, among grammarians, that belonging to the male. See GRAMMAR.

MASHAM, a market town of Yorkſhire, ſituated twenty-four miles north-weſt of the city of York.

MASK See MASQUE.

MASON, a perſon employed, under the direction of an architect, in raiſing of a ſtone-building.

Free and accepted MASONS, a very ancient ſociety or body of men, ſo called, either from ſome extraordinary knowledge of maſonry or building, which they are ſuppoſed to be maſters of, or becauſe the firſt founders of the ſociety were perſons of that profeſſion. Theſe are now very conſiderable, both for number and character, being found in every country in Europe, and conſiſting principally of perſons of merit and conſideration. As to antiquity, they lay claim to a ſtanding of ſome thouſand years. What the end of their inſtitution is, ſeems ſtill in ſome meaſure a ſecret; and they are ſaid to be admitted into the fraternity by being put in poſſeſſion of a great number of ſecrets, called the maſon's word, which have been religiouſly kept from age to age, being never divulged.

MASONRY, in general, a branch of architecture, conſiſting in the art of hewing or ſquaring ſtones, and cutting them level or perpendicular, for the uſes of building: but, in a more limited ſenſe, maſonry is the art of aſſembling and joining ſtones together with mortar. See ARCHITECTURE.

MASS, in the church of Rome, the office or prayers uſed at the celebration of the euchariſt; or, in other words, conſecrating the bread and wine into the body and blood of Chriſt, and offering them, ſo tranſubſtantiated, as an expiatory ſacrifice for the quick and the dead. As the maſs is in general believed to be a repreſentation of the paſſion of our bleſſed Saviour, ſo every

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every action of the prieſt, and every particular part of the ſervice, is ſuppoſed to allude to the particular circumſtances of his paſſion and death.

The general diviſion of maſſes conſiſts in high and low. The firſt is that ſung by the choriſters, and celebrated with the aſſiſtance of a deacon and ſub-deacon: low maſſes are thoſe in which the prayers are barely rehearſed without ſinging.

There are a great number of different or occaſional maſſes in the Romiſh church, many of which have nothing peculiar but the name: ſuch are the maſſes of the ſaints; that of St Mary of the ſnow, celebrated on the fifth of Auguſt; that of St Margaret, patroneſs of lying-in women; that of the feaſt of St John the Baptiſt, at which are ſaid three maſſes; that of the Innocents, at which the gloria in excelſis and the hallelujah are omitted, and it being a day of mourning the altar is of a violet colour. As to ordinary maſſes, ſome are ſaid for the dead, and, it is ſuppoſed, contribute to fetch the ſoul out of purgatory. At theſe maſſes the altar is put in mourning, and the only decorations are a croſs in the midſt of ſix yellow wax-lights: the dreſs of the celebrant and the very maſs-book are black: many parts of the office are omitted, and the people are diſmiſſed without the benediction. If the maſs be ſaid for a perſon diſtinguiſhed by his rank or virtues, it is followed with a funeral oration: they erect a chapelle ardente, that is, a repreſentation of the deceaſed, with branches and tapers of yellow wax, either in the middle of the church, or near the deceaſed's tomb, where the prieſt pronounces a ſolemn abſolution of the deceaſed. There are likewiſe private maſſes, ſaid for ſtolen or ſtrayed goods or cattle; for health; for travellers, &c. which go under the name of votive maſſes. There is ſtill a further diſtinction of maſſes denominated from the countries in which they were uſed; thus the Gothic maſs, or miſſa moſarabum, is that uſed among the Goths when they were maſters of Spain, and which is ſtill kept up at Toledo and Salamanca; the Ambroſian maſs is that compoſed by St Ambroſe, and uſed only at Milan, of which city he was biſhop; the Gallic maſs, uſed by the ancient Gauls; and the Roman maſs, uſed by almoſt all the churches in the Romiſh communion.

MASSA, the capital of the duchy of Maſſa Carara, in Italy, ſituated between the territories of Lucca and Genoa: E. long. 10° 40′, N lat. 43° 55′.

MASSACHUSET-COLONY, the principal ſub-diviſion of New-England, is bounded by New-Hampſhire, on the north; by the Atlantic ocean, on the eaſt and ſouth; and by Connecticut and New-York, on the weſt. It is about 100 miles long, and 40 broad.

MASSALIANS, a ſet of enthuſiaſts who ſprang up about the year 361, in the reign of the emperor Conſtantius, who maintained that men have two ſouls, a celeſtial and a diabolical, and that the latter is driven out by prayer.

MASSETER, in anatomy. See ANATOMY, p. 221.

MASSORA, in matters of literature, a critical work, containing remarks on the verſes, words, letters, and vowel-points of the Hebrew text of the bible; a work more laborious than uſeful.

MAST, in naval architecture, a large timber in a ſhip, for ſuſtaining the yards, ſails, &c.

In large veſſels there are four maſts, *viz.* the main-maſt, fore-maſt, mizen-maſt, and bowſprit. See SHIP-BUILDING.

MASTER, in general, is a title of authority; as, the grand maſter of Malta, the maſter of St Lazarus, &c.

The Romans had a great many officers thus denominated; as, the maſter of the people, or dictator; the maſter of the cavalry, foot, cenſus, &c.

MASTER *of arts*, is the firſt degree taken up in univerſities.

MASTERS *in chancery*, in ordinary, of which there are twelve, the maſter of the rolls being chief, are uſually choſen out of the barriſters of the common law, and ſit in chancery, or at the rolls, as aſſiſtants to the lord chancellor and maſter of the rolls.

MASTER *of the horſe*, a great officer of the crown, who orders all matters relating to the king's ſtables, races, breed of horſes; and commands the equerries and all the other officers and tradeſmen employed in the king's ſtables. His coaches, horſes, and attendants are the king's, and bear the king's arms and livery.

MASTER *of the revels*, an officer who orders all things relating to the performance of plays, maſks, balls, &c. at court.

MASTER *of the rolls*, a patent officer for life, who has the cuſtody of the rolls of parliament and patents which paſs the great-ſeal, and of the records of chancery, as alſo commiſſions, deeds, recognizances, which, being made of rolls of parchment, gave riſe to the name.

In abſence of the chancellor, he ſits as judge in the court of chancery: at other times, he hears cauſes in the rolls-chapel, and makes orders; but all hearings before him are appealable to the chancellor.

MASTER *of the wardrobe*, an officer under the lord chamberlain, who has the care of the royal robes, as well as the wearing apparel, collar, george, and garter, &c. He has alſo the charge of all former kings and queens robes remaining in the Tower, all hangings, bedding, &c. for the king's houſe, the charge and delivery of velvet and ſcarlet allowed for liveries. He has under him a clerk of the robes, wardrobe-keeper, a yeoman, &c.

MASTER-WORT, in botany. See IMPERATORIA.

MASTICATION, the action of chewing, or of agitating the ſolid parts of our food between the teeth, by means of the motion of the jaws, the tongue, and the lips, whereby it is broken into ſmall pieces, impregnated with ſaliva, and ſo fitted for deglutition and a more eaſy digeſtion.

MASTICH, in the materia medica, a ſolid reſin, of a pale, yellow, white colour, brought to us principally from the iſland of Chios, in drops or tears as it naturally forms itſelf in exſudating from the tree, about the bigneſs and much in the form of a pea. It is to be choſen clear, pellucid, and of a pale yellowiſh colour, well ſcented, and brittle. We meet with a kind of cæment ſometimes kept in the ſhops under the name of maſtich. It is compoſed of maſtich, and ſeveral other ingredients, and is formed into cakes for uſe. This is intended for the ſervice of the lapidaries, to fill up cracks in ſtones, and for other ſuch purpoſes:

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but is by no means to be uſed as maſtich for any of the medicinal purpoſes.

Maſtich is detergent, aſtringent, and ſtomachic; it is greatly recommended in inveterate coughs and againſt ſpitting of blood. It ſtrengthens the ſtomach, aſſiſts digeſtion, and ſtops vomiting.

MASTIGADOUR, or SLABBERING-BIT, in the manege, a ſnaffle of iron, all ſmooth, and of a piece, guarded with paternoſters, and compoſed of three halfs of great rings, made into demi-ovals, of unequal bigneſs; the leſſer being incloſed within the greater, which ought to be about half a foot high.

MASULIPATAN, a city and port-town of the hither India: E. long. 81°, and N. lat. 16° 18′.

MATAMAN, a country in the ſouth-weſt of Africa, bounded by Benguelo, on the north; by Manomotapa, on the eaſt; by Caffraria, on the ſouth; and by the Atlantic ocean, on the weſt.

MATAPAN CAPE, in the Morea, the ſouthmoſt promontory of Europe, ſituated in E. long. 22°, N. lat. 36°.

MATCH, a kind of rope ſlightly twiſted, and prepared to retain fire for the uſes of artillery, mines, fireworks, &c.

It is made of hempen tow, ſpun on the wheel like cord, but very ſlack; and is compoſed of three twiſts, which are afterwards again covered with tow, ſo that the twiſts do not appear: laſtly, it is boiled in the lees of old wines. This, when once lighted at the end, burns on gradually and regularly, without ever going out, till the whole be conſumed: the hardeſt and drieſt match is generally the beſt.

MATCHING, in the wine trade, the preparing veſſels to preſerve wines and other liquors, without their growing ſour or vapid. The method of doing it, is as follows: melt brimſtone in an iron ladle, and when thoroughly melted, dip into it ſlips of coarſe linen-cloth; take theſe out, and let them cool: this the wine coopers call a match; take one of theſe matches, ſet one end of it on fire, and put it into the bung-hole of a caſk; ſtop it looſely, and thus ſuffer the match to burn nearly out: then drive in the bung tight, and ſet the caſk aſide for an hour or two. At the end of this time examine the caſk, and you will find that the ſulphur has communicated a violent pungent and ſuffocating ſcent to the caſk, with a conſiderable degree of acidity, which is the gas and acid ſpirit of the ſulphur. The caſk may after this be filled with a ſmall wine, which has ſcarce done its fermentation; and bunging it down tight, it will be kept good, and will ſoon clarify: this is a common and very uſeful method; for many poor wines could ſcarce be kept potable even a few months without it.

Dura MATER. See ANATOMY, p. 284.

Pia MATER. See ANATOMY, p. 285.

MATERAN, the capital of a kingdom of the ſame name, ſituated on the ſouth coaſt of the iſland of Java. This city is ſaid to lie in E. long. 110°, S. lat. 7° 45′.

MATERIA SUBTILIS, denotes a fine ſubtile matter, which the Carteſians ſuppoſe to pervade and penetrate freely the pores of all bodies, to fill up all their pores ſo as not to leave the leaſt vacuity or interſtice between them: they had recourſe to this machine to ſupport the doctrine of an abſolute plenum, and to make it conſiſtent with the phænomenon of motion, &c.

MATERIA MEDICA, comprehends all the ſubſtances either uſed in medicine in their natural ſtate, or which afford preparations that are ſo; theſe belong partly to the animal, partly to the vegetable, and partly to the foſſil kingdom.

The preparations and virtues of all which are delivered under their reſpective articles, but in as conciſe and ſcrupulous a manner as we poſſibly could; ſince we cannot but remark, that it is too frequent in writers on the materia medica, to give us rather encomiums than impartial accounts of the ſimples they treat of.

MATHEMATICS, originally ſignified any diſcipline or learning; but, at preſent, denotes that ſcience which teaches, or contemplates, whatever is capable of being numbered or meaſured, in ſo far as computable or meaſurable; and accordingly is ſubdivided into Arithmetic, which has numbers for its object, and Geometry, which treats of magnitude. See ARITHMETICK and GEOMETRY.

Mathematics are commonly diſtinguiſhed into pure and ſpeculative, which conſider quantity abſtractedly; and mixed, which treat of magnitude as ſubſiſting in material bodies, and conſequently are interwoven every where with phyſical conſiderations.

Mixed mathematics are very comprehenſive; ſince to them may be referred Aſtronomy, Optics, Geography, Hydroſtatics, Mechanics Fortification, Navigation, &c. See the articles ASTRONOMY, OPTICS, &c.

Pure mathematics have one peculiar advantage, that they occaſion no diſputes among wrangling diſputants, as in other branches of knowledge; and the reaſon is, becauſe the definitions of the terms are premiſed, and every body that reads a propoſition has the ſame idea of every part of it. Hence it is eaſy to put an end to all mathematical controverſies, by ſhewing either that our adverſary has not ſtuck to his definitions, or has not laid down true premiſſes, or elſe that he has drawn falſe concluſions from true principles; and in caſe we are able to do neither of theſe, we muſt acknowledge the truth of what he has proved.

It is true, that in mixed mathematics, where we reaſon mathematically upon phyſical ſubjects, we cannot give ſuch juſt definitions as the geometricians: we muſt therefore reſt content with deſcriptions; and they will be of the ſame uſe as definitions, provided we are conſiſtent with ourſelves, and always mean the ſame thing by thoſe terms we have once explained.

Dr. Barrow gives a moſt elegant deſcription of the excellence and uſefulneſs of mathematical knowledge, in his inaugural oration, upon being appointed profeſſor of mathematics at Cambridge.

The mathematics, he obſerves, effectually exerciſe, not vainly delude, nor vexatiouſly torment, ſtudious minds with obſcure ſubtilties; but plainly demonſtrate every thing within their reach, draw certain concluſions, inſtruct by profitable rules, and unfold pleaſant queſtions. Theſe diſciplines likewiſe enure and corroborate the mind to a conſtant diligence in ſtudy; they wholly deliver us from a credulous ſimplicity, moſt ſtrongly fortify us againſt the vanity of ſcepticiſm, effectual

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fectually reſtrain us from a raſh preſumption, moſt eaſily incline us to a due aſſent, perfectly ſubject us to the government of right reaſon. While the mind is abſtracted and elevated from ſenſible matter, diſtinctly views pure forms, conceives the beauty of ideas, and inveſtigates the harmony of proportions: the manners themſelves are ſenſibly corrected and improved, the affections compoſed and rectified, the fancy calmed and ſettled, and the underſtanding raiſed and excited to more divine contemplations.

MATRASS, CUCURBIT, or BOLT-HEAD, among chemiſts. See CHEMISTRY, p. 109.

MATRICARIA, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is naked; it has, no pappus; the calix is hemiſpherical, and imbricated, with ſharp ſolid margins. There are five ſpecies, all of them natives of Britain, *viz.* The parthonium, or feverfew, which is reckoned good in hyſteric caſes; the chamomilla, or corn-feverfew, the flowers of which are ſtomachic; the ſuaveolens, or ſweet-ſcented feverfew; the inodora, or field feverfew; and the maritima, or ſea-feverfew.

MATRICULA, a regiſter kept of the admiſſion of officers and perſons entered into any body or ſociety, whereof a liſt is made.

MATRIX, in anatomy. See ANATOMY, p. 274.

MATRONALIA, a feſtival of the ancient Roman matrons, from whom it had its name. It was celebrated on the kalends of March in honour of the god Mars: and was to the Roman ladies what the feſtival of the Saturnalia was to their huſbands; for at this time they ſerved their women ſlaves at tables, and received preſents from their huſbands. See SATURNALIA.

MATROSSES, are ſoldiers in the train of artillery, who are next to the gunners, and aſſiſt them in loading, firing, and ſponging the great guns. They carry firelocks, and march along with the ſtore-waggons, both as a guard, and to give their aſſiſtance in caſe a waggon ſhould break down.

MATT, in a ſhip, rope-yard, junk, *&c.* beat flat and interwoven; uſed in order to preſerve the yards from galling or rubbing in hoiſting or lowering them.

MATTER, whatever is extended and capable of making reſiſtance: hence, becauſe all bodies, whether ſolid or fluid, are extended, and do reſiſt, we conclude that they are material, or made up of matter. See MECHANICS.

MATTHEW, or *Goſpel of St.* MATTHEW, a canonical book of the New Teſtament.

St. Matthew wrote his goſpel in Judea, at the requeſt of thoſe he had converted; and it is thought he began it in the year 41, eight years after Chriſt's reſurrection. It was written, according to the teſtimony of all the ancients, in the Hebrew or Syriac language, which was then common in Judea; but the Greek verſion of it, which now paſſes for the original, it as old as the apoſtolical times.

St. MATTHEW *the Evangeliſt's day*, a feſtival of the Chriſtian church, obſerved on September 21.

St. MATTHEW, in geography, a ſmall iſland on the coaſt of Guinea, planted by the Portugueſe, but deſerted: W. long. 9°, S. lat. 2° 30′.

St. MATTHIAS's *day*, a feſtival of the Chriſtian church, obſerved on the 24th of February.

MATTINS, the firſt canonical hour, or the firſt part of the daily ſervice, in the Romiſh church.

MATTURANTS, in pharmacy, medicines which promote the ſuppuration of tumours.

MAUNCH, in heraldry, the figure of an ancient coat-ſleeve, borne in many gentlemens eſcutcheons.

MAUNDY THURSDAY, is the Thurſday in Paſſion-week, which was called Maunday or Mandate-thurſday, from the command which our Saviour gave his apoſtles to commemorate him in the Lord's ſupper, which he this day inſtituted; or from the new commandment which he gave them to love one another, after he had waſhed their feet as a token of his love to them.

St. MAURA, an iſland of the Mediterranean, ſituated between the province of Epirus, and the iſland of Cephalonia; ſubject to Venice: E. long. 21°, N. lat. 38° 50′.

MAURICE, or MORITIUS, an iſland in the Indian ocean, ſubject to the Dutch: E. long. 55°, S. lat. 20°.

MAURIENNE, ST JOHN, the capital of the territory of Maurienne, in Savoy: E. long. 6° 10′, N. lat. 45° 18′.

MAURITANIA, the ancient name of the coaſt of Barbary, from the city of Tangier to that of Algiers: the weſt part of it, in which Tangier ſtands, was called Mauritania Tingitana; and that farther eaſt, Mauritania Cæſarienſis.

MAUSOLEUM, a magnificent tomb, or funeral monument. The word is derived from Mauſolus, king of Caria, to whom Artemiſia, his widow, erected a moſt ſtately monument, eſteemed one of the wonders of the world, and called it, from his name, Mauſoleum.

St. MAWES, a port and borough town of Cornwall: ſituated twenty miles north of the Lizard. It ſends two members to parliament.

MAXILLA, the jaws, or thoſe parts of an animal in which the teeth are ſet.

MAXIM, an eſtabliſhed propoſition or principle; in which ſenſe it denotes much the ſame with axiom.

MAXIMUM, in mathematics, denotes the greateſt quantity attainable in any given caſe.

If a quantity conceived to be generated by motion, increaſes, or decreaſes, till it arrives at a certain magnitude or poſition, and then on the contrary grows leſſer or greater, and it be required to determine the ſaid magnitude or poſition, the queſtion is called a problem de maximis et minimis.

MAY, the fifth month of the year, conſiſting of thirty-one days.

MAY, is alſo the name of a little iſland, in the mouth of the frith of Forth, in Scotland.

MAYENNE, a city of France, in the province of Orleanois: W. long. 45′, and N. lat. 48° 20′.

MAYO, one of the Cape Verde iſlands: W. long. 23°, N. lat. 15°.

MAYO, is alſo a county of Ireland, in the province of Connaught, having Slego on the north, and Roſcommon on the ſouth.

MAYOR,

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MAYOR, the chief magiſtrate of a city or town, choſen annually out of the aldermen.

MAZARA, the capital of the province of the ſame name in Sicily, ſituated on the ſouth-weſt coaſt: E. long. 12° 30′, N. lat. 37° 42′.

MEAD, an agreeable liquor, made of honey and water.

There are many receipts for making mead, of which the following is one of the beſt. Take four gallons of water, and as much honey as will make it bear an egg; add to this, the rind of three lemons; boil it, and ſcum it well as it riſes. Then take it off the fire, and add the three lemons cut in pieces; pour it into a clean tub or open veſſel, and let it work for three days: then ſcum it well, and pour off the clear part into a caſk, and let it ſtand open till it ceaſes to make a hiſſing noiſe; then ſtop it up cloſe, and in three months time it will be fine and fit for bottling.

If you would give it a finer flavour, take cloves, mace, and nutmeg, of each four drams; beat them ſmall, tie the powder in a piece of cloth, and put it into the caſk.

MEADOW, in its general ſignification, means paſture or graſs-land, annually mown for hay; but it is more particularly applied to lands that are ſo low as to be too moiſt for cattle to graze upon them in winter without ſpoiling the ſward.

MEAN, in general, denotes the middle between two extremes: thus we ſay, mean diſtance, mean proportion, *&c.*

MEASLES, in medicine, a cutaneous diſeaſe, attended with a fever, in which there is an appearance of eruptions that do not tend to a ſuppuration. See MEDICINE.

MEASURE, in geometry, denotes any quantity aſſumed as one, or unity, to which the ratio of other homogeneous or ſimilar quantities is expreſſed.

MEASURE, in a legal and commercial ſenſe, denotes a certain quantity or proportion of any thing bought, ſold, valued, or the like. Meaſures are then various, according to the various kinds and dimenſions of the things meaſured. Hence ariſe lineal or longitudinal meaſures, for lines or lengths; ſquare meaſures, for areas or ſuperficies; and ſolid or cubic meaſures, for bodies and their capacities. All which again are very different in different countries, and in different ages, and even many of them for different commodities. Whence ariſe other diviſions of ancient and modern meaſures, domeſtic and foreign ones, dry meaſures, liquid meaſures, *&c.* For the different kinds of meaſures, ſee ARITHMETIC, GEOMETRY, and the particular names of meaſures, as they occur in the alphabetical order.

MEASURE is alſo uſed to ſignify the cadence and time obſerved in poetry, dancing, and muſic, to render them regular and agreeable.

MEASURE, in muſic, the interval or ſpace of time which the perſon who beats time takes between the riſing and falling of his hand, in order to conduct the movement ſometimes quicker and ſometimes ſlower, according to the muſic or ſubject that is to be ſung or played.

MEAT. See FOOD, DIET, DRINK, *&c.*

MEATH, the name of two counties in Ireland, in the province of Leinſter, diſtinguiſhed by the epithets Eaſt and Weſt.

MEATUS AUDITORIUS, in anatomy. See ANATOMY, p. 296.

MEAUX, a city in France, twenty-four miles north-eaſt of Paris.

MECCA, the capital of Arabia, and place of Mohammed's nativity: E. long. 43° 30′, N. lat. 21° 20′.

It is a large well-built city, in the middle of which ſtands the caaba, or temple.

MECHANICS.

THIS term, in the common acceptation, implies no more than the nature of what is called the mechanical powers, together with the combination of theſe powers in the conſtruction of machines. But as the general properties of matter and central forces are neceſſary in order to a thorough knowledge of mechanics, we have joined all theſe ſubjects together under the general name of *Mechanics*.

Of MATTER, *and its Properties.*

BY the word *matter* is here meant every thing that has length, breadth, and thickneſs, and reſiſts the touch.

The inherent properties of matter are ſolidity, inactivity, mobility, and diviſibility.

The *ſolidity* of matter ariſes from its having length, breadth, thickneſs; and hence it is that all bodies are comprehended under ſome ſhape or other, and that every particular body hinders all others from occupying the ſame part of ſpace which it poſſeſſeth. Thus, if a piece of wood or metal be ſqueezed ever ſo hard between two plates, they cannot be brought into contact. And even water or air has this property; for if a ſmall quantity of it be fixed between any other bodies, they cannot be brought to touch one another.

A ſecond property of matter is *inactivity*, or *paſſiveneſs*; by which it always endeavours to continue in the ſtate that it is in, whether of reſt or motion. And therefore, if one body contains twice or thrice as much matter as another body does, it will have twice or thrice as much inactivity; that is, it will require twice or thrice as much force to give it an equal degree of motion, or to ſtop it after it hath been put into ſuch a motion.

That matter can never put itſelf into a motion is allowed by all men. For a ſtone, lying on the plain ſurface of the earth, never removes itſelf from that place, nor does any one imagine it ever can. But moſt people are apt to believe, that all matter has a propenſity to fall from a ſtate of motion into a ſtate of reſt; becauſe they ſee, that if a ſtone

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ſtone or a cannon-ball be put into ever ſo violent a motion, it ſoon ſtops; not conſidering that this ſtoppage is cauſed, 1. By the gravity or weight of the body, which ſinks it to the ground in ſpite of the impulſe; and, 2. By the reſiſtance of the air through which it moves, and by which its velocity is retarded every moment till it falls.

A bowl moves but a ſhort way upon a bowling-green; becauſe the roughneſs and unevenneſs of the graſſy ſurface ſoon creates friction enough to ſtop it. But if the green were perfectly level, and ſmooth, and the bowl were perfectly hard, round, and ſmooth, it would go a great way further; as it would have nothing but the air to reſiſt it: if then the air were taken away, the bowl would go on without any friction, and conſequently without any diminution of the velocity it had at ſetting out: and therefore, if the green were extended quite around the earth, the bowl would go on round and round the earth, for ever.

If the bowl were carried ſeveral miles above the earth, and there projected in a horizontal direction, with ſuch a velocity as would make it move more than a ſemidiameter of the earth, in the time it would take to fall to the earth by gravity: in that caſe, and if there were no reſiſting medium in the way, the bowl would not fall to the earth at all; but would continue to circulate round it, keeping always in the ſame tract, and returning to the ſame point from which it was projected, with the ſame velocity as at firſt. In this manner the moon moves round the earth, although ſhe be as unactive and dead as any ſtone upon it.

The third property of matter is *mobility*; for we find that all matter is capable of being moved, if a ſufficient degree of force be applied to overcome its inactivity or reſiſtance.

The fourth property of matter is *diviſibility*, of which there can be no end. For ſince matters can never be annihilated by cutting or breaking, we can never imagine it to be cut into ſuch ſmall particles, but that if one of them be laid on a table, the uppermoſt ſide of it will be further from the table than the undermoſt ſide.

Plate CV. fig. 1. That matter is infinitely diviſible in a mathematical ſenſe, is eaſy to be demonſtrated. For, let AB be the length of a particle to be divided; and let it be touched at oppoſite ends by the parallel lines CD and EF, which ſuppoſe to be infinitely extended beyond D and F. Set off the equal diviſions BG, GH, HI *&c.* on the line EF, towards the right hand from B; and take a point, as at R, any where towards the left hand from A, in the line CD: Then, from this point draw the right lines RG, RH RI, *&c* each of which will cut off a part from the particle AB. But after any finite number of ſuch lines are drawn, there will ſtill remain a part, as AP, at the top of the particle, which can never be cut off: becauſe the lines DR and EF being parallel, no line can ever be drawn from the point R to any point of the line EF that will coincide with the line RD. Therefore the particle AB contains more than any finite number of parts.

A fifth property of matter is *attraction*, which ſeems rather to be infuſed than inherent. Of this there are four kinds, viz. *coheſion*, *gravitation*, *magnetiſm*, and *electricity*.

The *attraction of coheſion* is that by which the ſmall parts of matter are made to ſtick and cohere together. Of this we have ſeveral inſtances, ſome of which follow.

1. If a ſmall glaſs tube, open at both ends, be dipt in water, the water will riſe up in the tube to a conſiderable height above its level in the baſon: which muſt be owing to the attraction of a ring of particles of the glaſs all around in the tube, immediately above thoſe to which the water at any inſtant riſes. And when it has riſen ſo high, that the weight of the column balances the attraction of the tube, it riſes no higher. This can be no ways owing to the preſſure of the air upon the water in the baſon; for, as the tube is open at top, it is full of air above the water, which will preſs as much upon the water in the tube as the neighbouring air does upon any column of an equal diameter in the baſon. Beſides, if the ſame experiment be made in an exhauſted receiver of the air-pump, there will be found no difference.

2. A piece of loaf-ſugar will draw up a fluid, and a ſponge will ſuck in water; and on the ſame principle ſap aſcends in trees.

3. If two drops of quickſilver be placed near each other, they will run together, and become one large drop.

4. If two pieces of lead be ſcraped clean, and preſſed together with a twiſt, they will attract each other ſo ſtrongly, as to require a force much greater than their own weight to ſeparate them. And this cannot be owing to the preſſure of the air, for the ſame thing will hold in an exhauſted receiver.

5. If two poliſhed plates of marble or braſs be put together, with a litle oil between them to fill up the pores in their ſurfaces, and prevent the lodgement of any air; they will cohere ſo ſtrongly, even if ſuſpended in an exhauſted receiver, that the weight of the lower plate will not be able to ſeparate it from the upper one. In putting theſe plates together, the one ſhould be rubbed upon the other, as a joiner does two pieces of wood when he glues them.

6. If two pieces of cork, equal in weight, be put near each other in a baſon of water, they will move equally faſt toward each other, with an accelerated motion, until they meet: and then, if either of them be moved, it will draw the other after it. If two corks of unequal weights be placed near each other, they will approach with accelerated velocities inverſely proportionate to their weights: that is, the lighter cork will move as much faſter than the heavier, as the heavier exceeds the lighter in weight. This ſhews that the attraction of each cork is in direct proportion to its weight or quantity of matter.

This kind of attraction reaches but to a very ſmall diſtance; for, if two drops of quickſilver be rolled in duſt, they will not run together, becauſe the particles of duſt keeps them out of the ſphere of each other's attraction.

Where the ſphere of attraction ends, a *repulſive force* begins; thus, water repels moſt bodies till they are wet; and hence it is, that a ſmall needle, if dry, ſwims upon water; and flies walk upon it without wetting their feet.

The repelling force of the particles of a fluid is but ſmall; and therefore, if a fluid be divided, it eaſily unites again. But if glaſs, or any other hard ſubſtance, be

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broke into ſmall parts, they cannot be made to ſtick together again without being firſt wetted: the repulſion being too great to admit of a re-union.

The repelling force between water and oil is ſo great, that we find it almoſt impoſſible to mix them ſo as not to ſeparate again. If a ball of light wood be dipt in oil, and then put into water, the water will recede ſo as to form a channel of ſome depth all around the ball.

The repulſive force of the particles of air is ſo great, that they can never be brought ſo near together by condenſation as to make them ſtick or cohere. Hence it is, that when the weight of the incumbent atmoſphere is taken off from any ſmall quantity of air, that quantity will diffuſe itſelf ſo as to occupy (in compariſon) an infinitely greater portion of ſpace than it did before.

Attraction of gravitation is that power by which diſtant bodies tend towards one another. Of this we have daily inſtances in the falling of bodies to the earth. By this power in the earth it is, that bodies, on whatever ſide, fall in lines perpendicular to its ſurface; and conſequently, on oppoſite ſides, they fall in oppoſite directions; all towards the centre, where the force of gravity is as it were accumulated; and by this power it is, that bodies on the earth's ſurface are kept to it on all ſides, ſo that they cannot fall from it. And as it acts upon all bodies in proportion to their reſpective quantities of matter, without any regard to their bulks or figures, it accordingly conſtitutes their weight. Hence,

If two bodies which contain equal quantities of matter, were placed at ever ſo great a diſtance from one another, and then left at liberty in free ſpace; if there were no other bodies in the univerſe to affect them, they would fall equally ſwift towards one another by the power of gravity, with velocities accelerated as they approached each other; and would meet in a point which was half way between them at firſt. Or, if two bodies containing unequal quantities of matter, were placed at any diſtance, and left in the ſame manner at liberty, they would fall towards one another with velocities which would be in an inverſe proportion to their reſpective quantities of matter; and moving faſter and faſter in their mutual approach, would at laſt meet in a point as much nearer to the place from which the heavier body began to fall, than to the place from which the lighter body began to fall, as the quantity of matter in the former exceeded that in the latter.

All bodies that we know of have gravity or weight. For, that there is no ſuch thing as poſitive levity, even in ſmoke, vapours, and fumes, is demonſtrable by experiments on the air-pump: which ſhews, that although the ſmoke of a candle aſcends to the top of a tall receiver, when full of air; yet upon the air's being exhauſted out of the receiver, the ſmoke falls down to the bottom of it. So, if a piece of wood be immerſed in a jar of water, the wood will riſe to the top of the water, becauſe it has a leſs degree of weight than its bulk of water has; but if the jar be emptied of water, the wood falls to the bottom.

As every particle of matter has its proper gravity, the effect of the whole muſt be in proportion to the number of the attracting particles; that is, as the quantity of matter in the whole body. This is demonſtrable by experiments on pendulums; for if they are of equal lengths, whatever their weights be, they vibrate in equal times. Now it is plain, that if one be double or triple the weight of another, it muſt require a double or triple power of gravity to make it move with the ſame celerity; juſt as it would require a double or triple force to project a bullet of twenty or thirty pound weight with the ſame degree of ſwiftneſs that a bullet of ten pounds would require. Hence, it is evident, that the power or force of gravity is always proportional to the quantity of matter in bodies, whatever their bulks or figures are.

Gravity alſo, like all other virtues or emanations which proceed or iſſue from a centre, decreaſes as the diſtance multiplied by itſelf increaſes: that is, a body at twice the diſtance of another attracts with only a fourth part of the force; at thrice the diſtance, with a ninth part; at four times the diſtance, with a ſixteenth part; and ſo on. This too is confirmed by comparing the diſtance which the moon falls in a minute from a right line touching her orbit, with the diſtance through which heavy bodies near the earth fall in that time; and alſo by comparing the forces which retain Jupiter's moons in their orbits, with their reſpective diſtances from Jupiter. Theſe forces will be explained afterwards.

The velocity which bodies near the earth acquire in deſcending freely by the force of gravity, is proportional to the times of their deſcent. For, as the power of gravity does not conſiſt in a ſingle impulſe, but is always operating in a conſtant and uniform manner, it muſt produce equal effects in equal times; and conſequently in a double or triple time, a double or triple effect; and ſo, by acting uniformly on the body, muſt accelerate its motion proportionably to the time of its deſcent.

To be a little more particular on this ſubject, let us ſuppoſe that a body begins to move with a celerity conſtantly and gradually increaſing, in ſuch a manner, as would carry it through a mile in a minute; at the end of this ſpace it will have acquired ſuch a degree of celerity, as is ſufficient to carry it two miles the next minute, tho' it ſhould then receive no new impulſe from the cauſe by which its motion had been accelerated: but if the ſame accelerating cauſe continues, it will carry the body a mile farther; on which account, it will have run through four miles at the end of two minutes; and then it will have acquired ſuch a degree of celerity, as is ſufficient to carry it through a double ſpace in as much more time, or eight miles in two minutes, even though the accelerating force ſhould act upon it no more. But this force ſtill continuing to operate in an uniform manner, will again, in an equal time, produce an equal effect; and ſo, by carrying it a mile further, cauſe it to move through five miles the third minute; for, the celerity already acquired, and the celerity ſtill acquiring, will each have its complete effect. Hence we learn, that if the body ſhould move one mile the firſt minute, it would move three the ſecond, five the third, ſeven the fourth, nine the fifth, and ſo on in proportion.

And thus it appears, that the ſpaces deſcribed in ſucceſſive equal parts of time, by an uniformly accelerated motion, are always as the odd numbers 1, 3, 5, 7, 9, *&c.*

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&c. and consequently, the whole spaces are as the squares of the times, or of the last acquired velocities. For, the continued addition of the odd numbers yields the squares of all numbers from unity upwards. Thus, 1, is the first odd number, and the square of 1 is 1; 3 is the second odd number, and this added to 1 makes 4, the square of 2; 5 is the third odd number, which added to 4 makes 9, the square of 3; and so on for ever. Since, therefore, the times and velocities proceed evenly and constantly as 1, 2, 3, 4, &c but the spaces described in each equal time are as 1, 3, 5, 7, &c. it is evident that the space described,

In 1 minute will be - - 1 = square of 1
In 2 minutes - - 1+3= 4 = square of 2
In 3 minutes - 1+3+5= 9 = square of 3
In 4 minutes 1+3+5+7=16 = square of 4 &c.

As heavy bodies are uniformly accelerated by the power of gravity in their descent, it is plain that they must be uniformly retarded by the same power in their ascent. Therefore, the velocity which a body acquires by falling, is sufficient to carry it up again to the same height from whence it fell; allowance being made for the resistance of the air, or other medium in which the body is moved. Thus, the body D (fig 2.) in rolling down the inclined plane AB, will acquire such a velocity by the time it arrives at B, as will carry it up to the inclined plane BC, almost to C; and would carry it quite up to C, if the body and plane were perfectly smooth, and the air gave no resistance.—So, if a pendulum were put into motion in a space quite void of air and all other resistance, and had no friction on the point of suspension, it would move for ever; for the velocity it had acquired in falling through the descending part of the arc, would be still sufficient to carry it equally high in the ascending part thereof.

The *centre of gravity* is that point of a body in which the whole force of its gravity or weight is united. Therefore, whatever supports that point bears the weight of the whole body; and whilst it is supported, the body cannot fall, because all its parts are in a perfect equilibrium about that point.

An imaginary line drawn from the centre of gravity of any body towards the centre of the earth, is called the *line of direction*. In this line all heavy bodies descend, if not obstructed.

Since the whole weight of a body is united in its centre of gravity, as that centre ascends or descends we must look upon the whole body to do so too. But as it is contrary to the nature of heavy bodies to ascend of their own accord, or not to descend when they are permitted; we may be sure that, unless the centre of gravity be supported, the whole body will tumble or fall. Hence it is, that bodies stand upon their bases when the line of direction falls within the base; for in this case the body cannot be made to fall without first raising the centre of gravity higher than it was before. Thus, the inclining body ABCD, (fig 3.) whose centre of gravity is E, stands firmly on its base CDIK, because the line of direction EF falls within the base. But if a weight, as ABGH, be laid upon the top of the body, the centre of gravity of the whole body and weight together is raised up to I; and and then, as the line of direction ID falls without the base at D, the centre of gravity I is not supported; and the whole body and weight tumble down together.

The broader the base is, and the nearer the line of direction is to the middle or centre of it, the more firmly does the body stand. On the contrary, the narrower the base, and the nearer the line of direction is to the side of it, the more easily may the body be overthrown: a less change of position being sufficient to remove the line of direction out of the base in the latter case than in the former. And hence it is, that a sphere is so easily rolled upon a horizontal plane; and that it is so difficult, if not impossible, to make things which are sharp pointed to stand upright on the point.—From what hath been said, it plainly appears, that if the plane be inclined on which the heavy body is placed, the body will slide down upon the plane whilst the line of direction falls within the base; but it will tumble or roll down when that line falls without the base. Thus, the body A (fig. 4.) will only slide down the inclined plane CD, whilst the body B rolls down upon it.

When the line of direction falls within the base of our feet, we stand; and most firmly, when it is in the middle: but when it is out of that base, we immediately fall. And it is not only pleasing, but even surprising, to reflect upon the various and unthought of methods and postures which we use, to retain this position, or to recover it when it is lost. For this purpose, we bend our body forward when we rise from a chair, or when we go up stairs: and for this purpose a man leans forward when he carries a burden on his back, and backward when he carries it on his breast, and to the right or left side as he carries it on the oppofite side.

The quantity of matter in all bodies is in exact proportion to their weights, bulk for bulk. Therefore, heavy bodies are as much more dense or compact than light bodies of the same bulk, as they exceed them in weight.

All bodies are full of pores, or spaces void of matter: and in gold, which is the heaviest of all known bodies, there is perhaps a greater quantity of space than of matter. For the particles of heat and magnetism find an easy passage through the pores of gold; and even water itself has been forced through them. Besides, if we consider how easily the rays of light pass through so solid a body as glass, in all manner of directions, we shall find reason to believe that bodies are exceedingly porous.

All bodies are some way or other affected by heat; and all metallic bodies are expanded in length, breadth, and thickness thereby —The proportion of the expansion of several metals, according to the best experiments, is nearly thus. Iron and glass as 3, steel 4, copper 4 and one eighth, brass 5, tin 6, lead 6 and one eighth. An iron rod 3 feet long is about one 70th part of an inch longer in summer than in winter.

The expansion of metals by heat, is demonstrated by the following machine, called a pyrometer. AA (fig. 5.) is a flat piece of mahogony, in which are fixed four brass studs B,C,D,L: and two pins, one at F, and the other at H. On the pin F turns the crooked index EI, and upon the pin H the straight index GK; against which a piece of watch-spring R bears gently, and so presses it towards

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towards the beginning of the ſcale MN, over which the point of that index moves. This ſcale is divided into inches and tenth parts of an inch: the firſt inch is marked 1000, the ſecond 2000, and ſo on. A bar of metal O is laid into notches in the top of the ſtuds C and D; one end of the bar bearing againſt the adjuſting ſcrew P, and the other end againſt the crooked index EI, at a 20th part of its length from its centre of motion F.—Now it is plain, that however much the bar O lengthens, it will move that part of the index EI againſt which it bears juſt as far: but the crooked end of the ſame index, near H, being 20 times as far from the centre of motion F as the point is againſt which the bar bears, it will move 20 times as far as the bar lengthens. And as this crooked end bears againſt the index GK at only a 20th part of its whole length GS from its centre of motion H, the point S will move through 20 times the ſpace that the point of bearing near H does. Hence, as 20 multiplied by 20 produces 400, it is evident, that if the bar lengthens but a 400th part of an inch, the point S will move a whole inch on the ſcale; and as every inch is divided into 10 equal parts, if the bar lengthens but the 10th part of the 400th part of an inch, which is only the 4000th part of an inch, the point S will move the tenth part of an inch, which is very perceptible.

To find how much a bar lengthens by heat, firſt lay it cold into the notches of the ſtuds, and turn the adjuſting ſcrew P until the ſpring R brings the point S of the index GK to the beginning of the diviſions of the ſcale at M: then, without altering the ſcrew any farther, take off the bar, and rub it with a dry woollen cloth till it feels warm: and then, laying it on where it was, obſerve how far it puſhes the point S upon the ſcale by means of the crooked index EI; and the point S will ſhew exactly how much the bar has lengthened by the heat of rubbing. As the bar cools, the ſpring R bearing againſt the index KG, will cauſe its point S to move gradually back towards M in the ſcale: and when the bar is quite cold, the index will reſt at M, where it was before the bar was made warm by rubbing. The indexes have ſmall rollers under them at I and K; which, by turning round on the ſmooth wood as the indexes move, make their motions the eaſier, by taking off a great part of the friction, which would otherwiſe be on the pins F and H, and of the points of the indexes themſelves on the wood.

Beſides the univerſal properties above mentioned, there are bodies which have properties peculiar to themſelves: ſuch as the loadſtone, in which the moſt remarkable are theſe, 1. It attracts iron and ſteel only. 2. It conſtantly turns one of its ſides to the north and another to the ſouth, when ſuſpended by a thread that does not twiſt. 3. It communicates all its properties to a piece of ſteel when rubbed upon it, without loſing any itſelf.

According to Dr Helſham's experiments, the attraction of the loadſtone decreaſes as the ſquare of the diſtance increaſes. Thus, if a loadſtone be ſuſpended at one end of a balance, and counterpoiſed by weights at the other end, and a flat piece of iron be placed beneath it, at the diſtance of four tenths of an inch, the ſtone will immediately deſcend and adhere to the iron. But if the ſtone be again removed to the ſame diſtance, and as many grains be put into the ſcale at the other end as will exactly counterbalance the attraction, then, if the iron be brought twice as near the ſtone as before, that is, only two tenth-parts of an inch from it, there muſt be four times as many grains put into the ſcale as before, in order to be a juſt counterbalance to the attractive force, or to hinder the ſtone from deſcending and adhering to the iron. So if four grains will do in the former caſe, there muſt be ſixteen in the latter. But from ſome later experiments, made with the greateſt accuracy, it is found that the force of magnetiſm decreaſes in a ratio between the reciprocal of the ſquare and the reciprocal of the cube of the diſtance; approaching to the one or the other, as the magnitudes of the attracting bodies are varied.

Several bodies, particularly amber, glaſs, jet, ſealing-wax, agate, and almoſt all precious ſtones, have a peculiar property of attracting and repelling light bodies when heated by rubbing. This is called *electrical attraction*; for the properties of which, ſee ELECTRICITY.

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WE have already mentioned it as a neceſſary conſequence ariſing from the deadneſs or inactivity of matter, that all bodies endeavour to continue in the ſtate they are in, whether of reſt or motion. If the body A (fig. 6.) were placed in any part of free ſpace, where nothing either draws or impels it any way, it would for ever remain in that part of ſpace, becauſe it could have no tendency of itſelf to remove any way from thence. If it receives a ſingle impulſe any way, as ſuppoſe from A towards B, it will go on in that direction; for, of itſelf it could never ſwerve from a right line, nor ſtop its courſe.—When it has gone through the ſpace AB, and met with no reſiſtance, its velocity will be the ſame at B as it was at A; and this velocity, in as much more time, will carry it through as much more ſpace, from B to C; and ſo on for ever. Therefore, when we ſee a body in motion; we conclude that ſome other ſubſtance muſt have given it that motion; and when we ſee a body fall from motion to reſt, we conclude that ſome other body or cauſe ſtopt it.

As all motion is naturally rectilineal, it appears, that a bullet projected by the hand, or ſhot from a cannon, would for ever continue to move in the ſame direction it received at firſt, if no other power diverted its courſe. Therefore, when we ſee a body move in a curve of any kind whatever, we conclude it muſt be acted upon by two powers at leaſt; one putting it in motion, and another drawing it off from the rectilineal courſe it would otherwiſe have continued to move in: and whenever that power, which bent the motion of the body from a ſtraight line into a curve, ceaſes to act, the body will again move on in a ſtraight line, touching that point of the curve in which it was when the action of that power ceaſed. For example, a pebble moved round in a ſling ever ſo long a time, will fly off the moment it is ſet at liberty by ſlipping one end of the ſling cord; and will go on in a line touching the circle it deſcribed before; which line would actually be a ſtraight one, if the earth's attraction did not affect the pebble, and bring it down to the ground. This ſhews, that the natural tendency of the pebble, when put

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put into motion, is to continue moving in a ſtraight line, although by the force that moves the ſling it be made to revolve in a circle.

The change of motion produced is in proportion to the force impreſſed: for the effects of natural cauſes are always proportionate to the force or power of thoſe cauſes.

By theſe laws it is eaſy to prove that a body will deſcribe the diagonal of a ſquare or parallelogram, by two forces conjoined, in the ſame time that it would deſcribe either of the ſides by one force ſingly. Thus, ſuppoſe the body A (fig. 7.) to repreſent a ſhip at ſea; and that it is drove by the wind, in the right line AB, with ſuch a force as would carry it uniformly from A to B in a minute: then, ſuppoſe a ſtream or current of water running in the direction AD, with ſuch a force as would carry the ſhip through an equal ſpace from A to D in a minute. By theſe two forces, acting together at right angles to each other, the ſhip will deſcribe the line AEC in a minute: which line (becauſe the forces are equal and perpendicular to each other,) willl be the diagonal of an exact ſquare. To confirm this law by an experiment, let there be a wooden ſquare ABCD (fig. 8.) ſo contrived, as to have the part BEFC made to draw out or puſh into the ſquare at pleaſure. To this part let the pulley H be joined, ſo as to turn freely on an axis, which will be at H when the piece is puſhed in, and at *b* when it is drawn out. To this part let the ends of a ſtraight wire *k* be fixed, ſo as to move along with it, under the pulley: and let the ball G be made to ſlide eaſily on the wire. A thread *m* is fixed to this ball, and goes over the pulley to I; by this thread the ball may be drawn up on the wire, parallel to the ſide AD, when the part BEFC is puſhed as far as it will go into the ſquare. But, if this part be drawn out, it will carry the ball along with it, parallel to the bottom of the ſquare DC. By this means, the ball G may either be drawn pependicularly upward by pulling the thread *m*, or moved horiſontally along by pulling out the part BEFC, in equal times, and through equal ſpaces; each power acting equably and ſeparately upon it. But if, when the ball is at G, the upper end of the thread be tied to the pin I, in the corner A of the fixed ſquare, and the moveable part BEFG be drawn out, the ball will then be acted upon by both the powers together: for it will be drawn up by the thread towards the top of the ſquare, and at the ſame time carried with its wire *k* towards the right hand BC, moving all the while in the diagonal line L; and will be found at *g* when the ſliding part is drawn out as far as it was before, which then will have cauſed the thread to draw up the ball to the top of the inſide of the ſquare, juſt as high as it was before, when drawn up ſingly by the thread without moving the ſliding part.

If the acting forces are equal, but at obliqne angles to each other, ſo will the ſides of the parallelogram be: and the diagonal run through by the moving body will be longer or ſhorter, according as the obliquity is greater or ſmaller. Thus, if two equal forces act conjointly upon the body A, (fig. 9) one having a tendency to move it through the ſpace AB in the ſame time that the other has a tendency to move it through an equal ſpace AD; it will deſcribe the diagonal AGC in the ſame time that either of the ſingle forces would have cauſed it to deſcribe either of the ſides. If one of the forces be greater than the other, then one ſide of the parallelogram will be ſo much longer than the other. For if one force ſingly would carry the body through the ſpace AE, in the ſame time that the other would have carried the ſpace AD, the joint action of both will carry it in the ſame time through the ſpace AHF, which is the diagonal of the oblique parallelogram ADEF.

If both forces act upon the body in ſuch a manner, as to move it uniformly, the diagonal deſcribed will be a ſtraight line; but if one of the forces acts in ſuch a manner as to make the body move faſter and faſter as it goes forward, then the line deſcribed will be a curve. And this is the caſe of all bodies which are projected in rectilineal directions, and at the ſame time acted upon by the power of gravity, which has a conſtant tendency to accelerate their motions in the direction wherein it acts.

Laws of the Planetary motions.

From the uniform projectile motion of bodies in ſtraight lines, and the univerſal power of gravity or attraction, ariſes the curvilineal motion of all the heavenly bodies. If the body A (fig. 10.) be projected along the ſtraight line AFH in open ſpace, where it meets with no reſiſtance, and is not drawn aſide by any power, it will go on for ever with the ſame velocity, and in the ſame direction. But if, at the ſame moment the projectile force is given it at A, the body S begins to attract it with a force duly adjuſted *, and perpendicular to its motion at A, it will then be drawn from the ſtraight line AFH, and forced to revolve about S in the circle ATW; in the ſame manner, and by the ſame law, that a pebble is moved round in a ſling. And if, when the body is in any part of its orbit (as ſuppoſe at K) a ſmaller body as L, within the ſphere of attraction of the body K, be projected in the right line LM, with a force duly adjuſted, and perpendicular to the line of attraction LK; then, the ſmall body L will revolve about the large body K in the orbit NO, and accompany it in its whole courſe round the yet larger body S. But then, the body K will no longer move in the circle ATW; for that circle will now be deſcribed by the common centre of gravity between K and L. Nay, even the great body S will not keep in the centre; for it will be the common centre of gravity between all the three bodies S, K, and L, that will remain immoveable there. So, if we ſuppoſe S and K connected by a wire P that has no weight, and K and L connected by a wire *q* that has no weight, the common centre of gravity of all theſe three bodies will be a point in the wire P near S; which point being ſupported, the bodies will be all in *equilibrio* as they move round it. Though indeed, ſtrictly ſpeaking, the common centre of gravity of all the three bodies will not be in the wire

* To make the projectile force a juſt balance to the gravitating power, ſo as to keep the planet moving in a circle, it muſt give ſuch a velocity as the planet would acquire by gravity when it had fallen through half the ſemidiameter of that circle.

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P but when theſe bodies are all in a right line. Here, S may repreſent the ſun, K the earth, and L the moon.

In order to form an idea of the curves deſcribed by two bodies revolving about their common centre of gravity, whilſt they themſelves with a third body are in motion round the common centre of gravity of all the three; let us firſt ſuppoſe E (Plate CVI. fig. 1.) to be the ſun, and *e* the earth going round him with any moon; and their moving forces regulated as above. In this caſe, whilſt the earth goes round the ſun in the dotted circle RTUWX, *&c.* the ſun will go round the circle ABD, whoſe centre C is the common centre of gravity between the ſun and and earth: the right line *βδ* repreſenting the mutual attraction between them, by which they are as firmly connected as if they were fixed at the two ends of an iron bar ſtrong enough to hold them. So, when the earth is at *e*, the ſun will be at E; when the earth is at T, the ſun will be at F; and when the earth is at *g*, the ſun will be at G, *&c.*

Now, let us take in the moon *q* (at the top of the figure,) and ſuppoſe the earth to have no progreſſive motion about the ſun; in which caſe, whilſt the moon revolves about the earth in her orbit ABC, the earth will revolve in the circle S 13, whoſe centre R is the common centre of gravity of the earth and moon; they being connected by the mutual attraction between them in the ſame manner as the earth and ſun are.

But the truth is, that whilſt the moon revolves about the earth, the earth is in motion about the ſun; and now, the moon will cauſe the earth to deſcribe an irregular curve, and not a true circle, round the ſun; it being the common centre of gravity of the earth and moon that will then deſcribe the ſame circle which the earth would have moved in, if it had not been attended by a moon. For, ſuppoſing the moon to deſcribe a quarter of her progreſſive orbit about the earth in the time that the earth moves from *e* to *f*, it is plain that when the earth comes to *f*, the moon will be found at *r*; in which time, their common centre of gravity will have deſcribed the dotted arc R1T, the earth the curve R5*f*, and the moon the curve *q* 14*r*. In the time that the moon deſcribes another quarter of her orbit, the centre of gravity of the earth and moon will deſcribe the dotted arc T2U, the earth the curve *f*6*g*, and the moon the curve *r* 15*s*, and ſo on.—And thus, whilſt the moon goes once round the earth in her progreſſive orbit, their common centre of gravity deſcribes the regular portion of a circle R1T2U3V4W, the earth the irregular curve R5*f*6*g*7*h*8*i*, and the moon the yet more irregular curve *q*14*r*15*s*16*t*17*u*; and then, the ſame kind of tracks over again.

The centre of gravity of the earth and moon is 6000 miles from the earth's centre towards the moon; therefore the circle S 13 which the earth deſcribes round that centre of gravity (in every courſe of the moon round her orbit) is 12000 miles in diameter. Conſequently, the earth is 12000 miles nearer the ſun at the time of full moon than at the time of new. [See the earth at *f* and at *b*.]

To avoid confuſion in ſo ſmall a figure, we have ſuppoſed the moon to go only twice and a-half round the earth, in the time that the earth goes once round the ſun: it being impoſſible to take in all the revolutions which ſhe makes in a year, and to give a true figure of her path, unleſs we ſhould make the ſemidiameter of the earth's orbit at leaſt 84 inches; and then, the proportional ſemidiameter of the moon's orbit would be only a quarter of an inch.

If the moon made any complete number of revolutions about the earth in the time that the earth makes one revolution about the ſun, the paths of the ſun and moon would return into themſelves at the end of every year; and ſo be the ſame over again: but they return not into themſelves in leſs than 19 years nearly; in which time, the earth makes nearly 19 revolutions about the ſun, and the moon 235 about the earth.

If the planet A (Plate CV. fig. 10.) be attracted towards the ſun, with ſuch a force as would make it fall from A to B, in the time that the projectile impulſe would have carried it from A to F, it will deſcribe the arc AG by the combined action of theſe forces, in the ſame time that the former would have cauſed it to fall from A to B, or the latter have carried it from A to F. But, if the projectile force had been twice as great, that is, ſuch as would have carried the planet from A to H, in the ſame time that now, by the ſuppoſition, it carries it only from A to F; the ſun's attraction muſt then have been four times as ſtrong as formerly, to have kept the planet in the circle ATW; that is, it muſt have been ſuch as would have cauſed the planet to fall from A to E, which is four times the diſtance of A from B, in the time that the projectile force ſingly would have carried it from A to H, which is only twice the diſtance of A from F. Thus, a double projectile force will balance a quadruple power of gravity in the ſame circle; as appears plain by the figure, and ſhall ſoon be confirmed by an experiment.

Plate CVI. fig. 2. The whirling-table is a machine contrived for ſhewing experiments of this nature. AA is a ſtrong frame of wood, B a winch or handle fixed on the axis C of the wheel D, round which is the catgut ſtring F, which alſo goes round the ſmall wheels G and K, croſſing between them and the great wheel D. On the upper end of the axis of the wheel G, above the frame, is fixed the round board *d*, to which the bearer MSX may be faſtened occaſionally, and removed when it is not wanted. On the axis of the wheel H is fixed the bearer NTZ: and it is eaſy to ſee, that when the winch B is turned, the wheels and bearers are put into a whirling motion.

Each bearer has two wires, W,X, and Y,Z, fixed and ſcrewed tight into them at the ends by nuts on the outſide. And when theſe nuts are unſcrewed, the wires may be drawn out in order to change the balls U and V, which ſlide upon the wires by means of braſs loops fixed into the balls, which keep the balls up from touching the wood below them. A ſtrong ſilk line goes through each ball, and is fixed to it at any length from the centre of the bearer to its end, as occaſion requires, by a nut-ſcrew at the top of the ball; the ſhank of the ſcrew going into the centre of the ball and preſſing the line againſt the under ſide of the hole that it goes through.—The line goes from the ball, and under a ſmall pulley fixt in the middle of the bearer; then up through a ſocket in the round

plate

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Fig. 1.

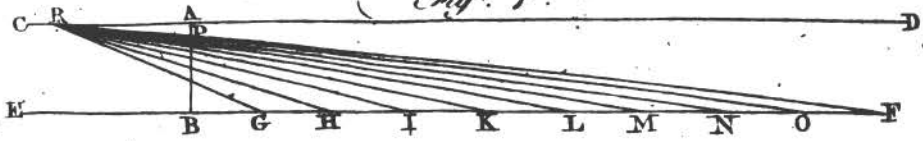
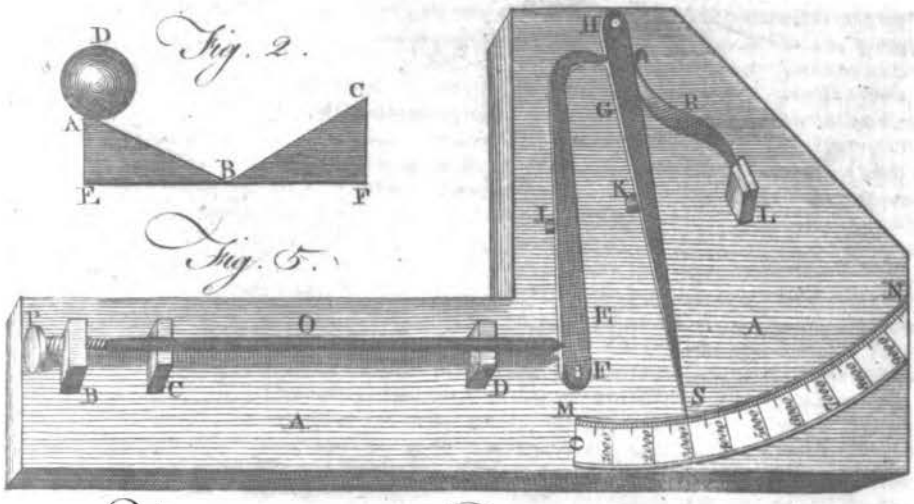


Fig. 2.

Fig. 5.



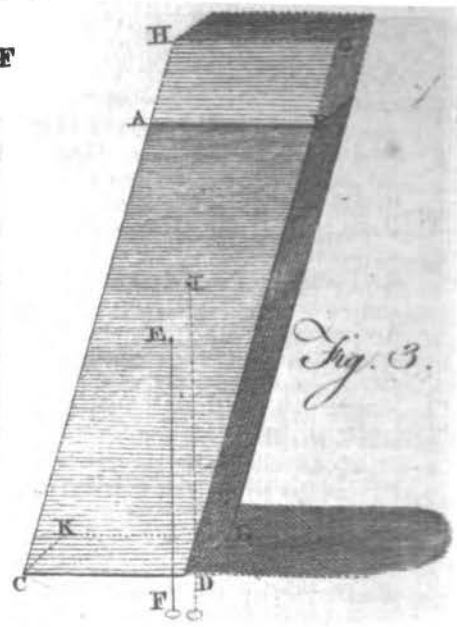


Fig. 3.

Fig. 9.

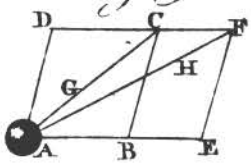
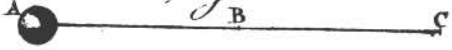


Fig. 6.



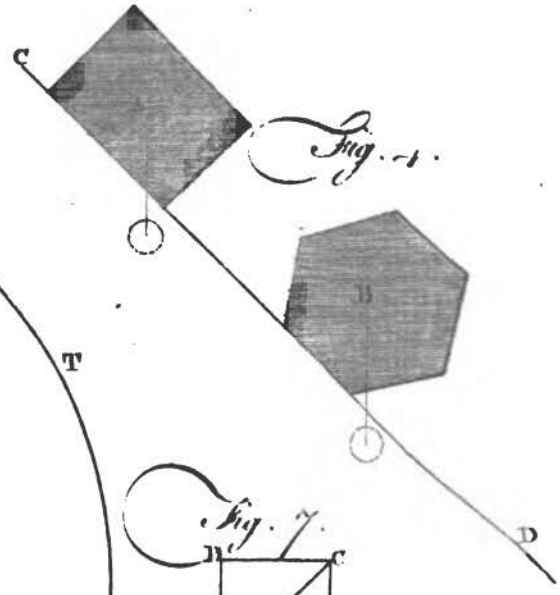


Fig. 4.

Fig. 10.

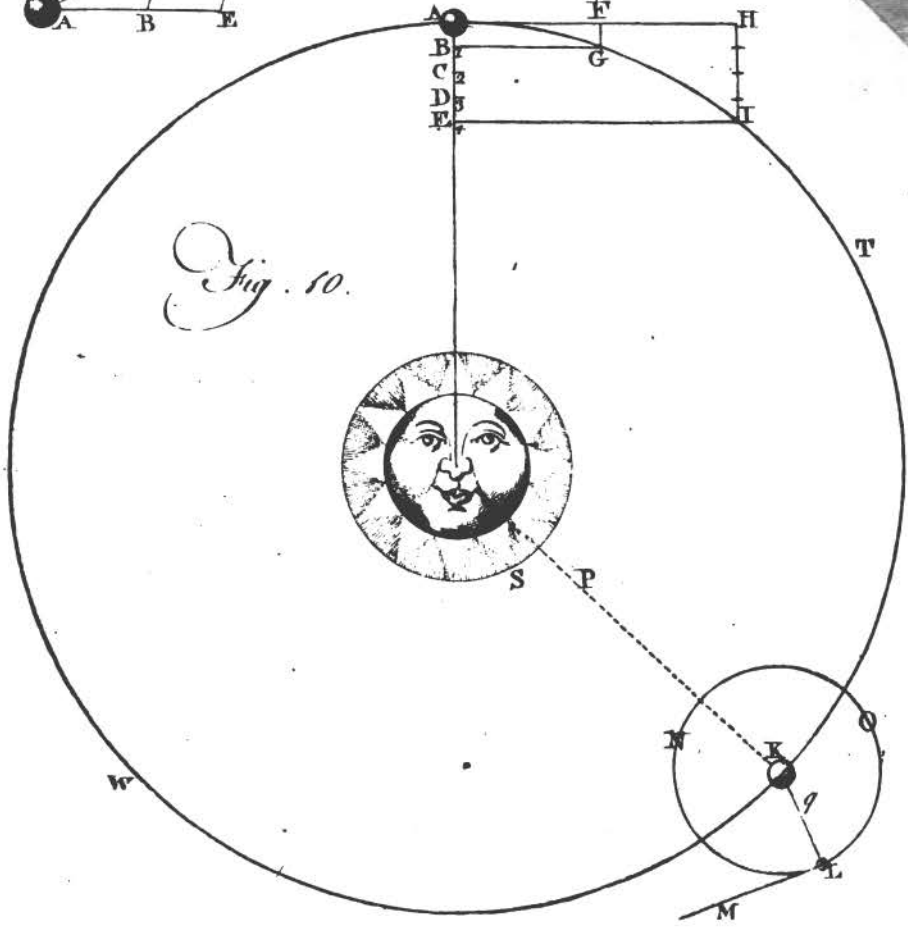


Fig. 7.

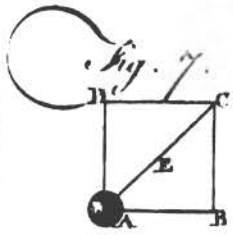


Fig. 8.

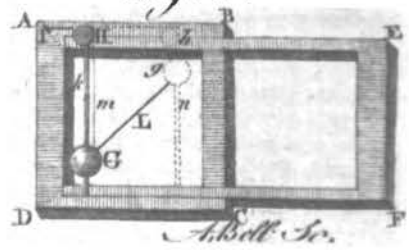


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plate (ſee S and T) in the middle of each bearer; then through a ſlit in the middle of the ſquare top (O and P) of each tower, and, going over a ſmall pulley on the top, comes down again the ſame way, and is at laſt faſtened to the upper end of the ſocket fixt in the middle of the above-mentioned round plate. Theſe plates S and T have each four round holes near their edges for letting them ſlide up and down upon the wires which make the corner of each tower. The balls and plates being thus connected each by its particular line, it is plain, that if the balls be drawn outward, or towards the ends M and N of their reſpective bearers, the round plates S and T will be drawn up to the top of their reſpective towers O and P.

There are ſeveral braſs weights, ſome of two ounces, ſome of three, and ſome of four, to be occaſionally put within the towers O and P, upon the round plates S and T: each weight having a round hole in the the middle of it, for going uponathe ſockets or axes of the plates, and is ſlit from the edge to the hole, for allowing it to be ſlipt over the foreſaid line which comes from each ball to its reſpective plate.

The experiments to be made by this machine are,

1. Take away the bearer MX, and take the ivory ball *a*, to which the line or ſilk cord *b* is faſtened at one end; and having made a loop on the other end of the cord, put the loop over a pin fixt in the centre of the board *d*. Then, turning the winch B to give the board a whirling motion, you will ſee that the ball does not immediately begin to move with the board; but, on account of its inactivity, it endeavours to continue in the ſtate of reſt which it was in before.—Continue turning, until the board communicates an equal degree of motion with its own to the ball; and then turning on, you will perceive that the ball will remain upon one part of the board, keeping the ſame velocity with it, and having no relative motion upon it, as is the caſe with every thing that lies looſe upon the plane ſurface of the earth, which having the motion of the earth communicated to it, never endeavours to remove from that place. But ſtop the board ſuddenly by hand, and the ball will go on, and continue to revolve upon the board, until the friction thereof ſtops its motion: which ſhews, that matter being once put into motion, would continue to move for ever, if it met with no reſiſtance. In like manner, if a perſon ſtands upright in a boat before it begins to move, he can ſtand firm; but the moment the boat ſets off, he is in danger of falling towards that place which the boat departs from: becauſe, as matter, he has no natural propenſity to move. But when he acquires the motion of the boat, let it be ever ſo ſwift, if it be ſmooth and uniform, he will ſtand as upright and firm as if he was on the plain ſhore; and if the boat ſtrike againſt any obſtacle, he will fall towards that obſtacle; on account of the propenſity he has, as matter, to keep the motion which the boat has put him into.

2. Take away this ball, and put a longer cord to it, which may be put down through the hollow axis of the bearer MX, and wheel G. and fix a weight to the end of the cord below the machine; which weight, if left at liberty, will draw the ball from the edge of the whirling-board to its centre.

Draw off the ball a little from the centre, and turn the winch; then the ball will go round and round with the board, and will gradually fly off farther and farther from the centre, and raiſe up the weight below the machine: which ſhews that all bodies revolving in circles have a tendency to fly off from theſe circles, and muſt have ſome power acting upon them from the centre of motion, to keep them from flying off. Stop the machine, and the ball will continue to revolve for ſome time upon the board; but as the friction gradually ſtops its motion, the weight acting upon it will bring it nearer and nearer to the centre in every revolution, until it brings it quite thither. This ſhews, that if the planets met with any reſiſtance in going round the ſun, its attractive power would bring them nearer and nearer to it in every revolution, until they fell into it.

3. Take hold of the cord below the machine with one hand, and with the other throw the ball upon the round board as it were at right angles to the cord, by which means it will go round and round upon the board. Then, obſerving with what velocity it moves, pull the cord below the machine, which will bring the ball nearer to the centre of the board, and you will ſee that the nearer the ball is drawn to the centre, the faſter it will revolve; as thoſe planets which are neareſt the ſun revolve faſter than thoſe which are more remote; and not only go round ſooner, becauſe they deſcribe ſmaller circles, but even move faſter in every part of their reſpective circles.

Take away this ball, and apply the bearer MX, whoſe centre of motion is in its middle at *w*, directly over the centre of the whirling-board *d*. Then put two balls (V and U) of equal weights upon their bearing wires; and having fixed them at equal diſtances from their reſpective centres of motion *w* and *x* upon their ſilk cords, by the ſcrew-nuts, put equal weights in the towers O and P. Laſtly, put the catgut ſtrings E and F upon the grooves G and H of the ſmall wheels; which being of equal diameters, will give equal velocities to the bearers above, when the winch B is turned; and the balls U and V will fly off towards M and N, and will raiſe the weights in the towers at the ſame inſtant. This ſhews, that when bodies of equal quantities of matter revolve in equal circles with equal velocities, their centrifugal forces are equal.

5. Take away theſe equal balls, and, inſtead of them, put a ball of ſix ounces into the bearer MX, at a ſixth part of the diſtance *wx* from the centre, and put a ball of one ounce into the oppoſite bearer, at the whole diſtance *xy*, which is equal to *wx* from the centre of the bearer; and fix the ball at theſe diſtances on their cords, by the ſcrew-nuts at top; then the ball U, which is ſix times as heavy as the ball V, will be at only a ſixth part of the diſtance from its centre of motion; and conſequently will revolve in a circle of only a ſixth part of the circumference of the circle in which V revolves. Now, let any equal weights be put into the towers, and the machine be turned by the winch; which (as the catgut ſtring is on equal wheels below) will cauſe the balls to revolve in equal times; but V will move ſix times as faſt as U, becauſe it revolves in a circle of ſix times its radius; and both the weights in the towers will riſe at once. This ſhews, that the centrifugal forces of revolving bodies, (or their

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their tendencies to fly off from the circles they deſcribe) are in direct proportion to their quantities of matter multiplied into their reſpective velocities, or into their diſtances from the centres of their reſpective circles. For, ſuppoſing U, which weighs 6 ounces, to be two inches from its centre of motion *w*, the weight multiplied by the diſtance is 12; and ſuppoſing V, which weighs only one ounce, to be 12 inches diſtant from its centre of motion *x*; the weight 1 ounce multiplied by the diſtance 12 inches is 12. And as they revolve in equal times, their velocities are as their diſtances from the centre, namely, as 1 to 6.

If theſe two balls be fixed at equal diſtances from their reſpective centres of motion, they will move with equal velocities; and if the tower O has 6 times as much weight put into it as the tower P has, the balls will raiſe their weight at the ſame moment. This ſhews, that the ball U, being ſix times as heavy as the ball V, has ſix times as much centrifugal force, in deſcribing an equal circle with an equal velocity.

6. If bodies of equal weights revolve in equal circles with unequal velocities, their centrifugal forces are as the ſquares of the velocities. To prove this law by an experiment, let two balls U and V of equal weights be fixed on their cords at equal diſtances from their reſpective centres of motion *w* and *x*: and then let the catgut ſtring E be put round the wheel K (whoſe circumference is only one half of the circumference of the wheel H or G) and over the pulley *s* to keep it tight; and let four times as much weight be put in the tower P as in the tower O. Then turn the winch B, and the ball V will revolve twice as faſt as the ball U in a circle of the ſame diameter, becauſe they are equidiſtant from the centres of the circles in which they revolve; and the weights in the towers will both riſe at the ſame inſtant; which ſhews, that a double velocity in the ſame circle will exactly balance a quadruple power of attraction in the centre of the circle. For the weights in the towers may be conſidered as the attractive forces in the centres, acting upon the revolving balls; which, moving in equal circles, is the ſame thing as if they both moved in one and the ſame circle.

7. If bodies of equal weights revolve in unequal circles, in ſuch a manner that the ſquares of the times of their going round are as the cubes of their diſtances from the centres of the circles they deſcribe; their centrifugal forces are inverſely as the ſquares of their diſtances from thoſe centres. For, the catgut ſtring remaining as in the laſt experiment, let the diſtance of the ball V from the centre *x* be made equal to two of the croſs diviſions on its bearer, and the diſtance of the ball U from the centre *w* be three and a ſixth part; the balls themſelves being of equal weights, and V making two revolutions by turning the winch in the time that U makes one: ſo that if we ſuppoſe the ball V to revolve in one moment, the ball U will revolve in two moments, the ſquares of which are one and four: for the ſquare of 1 is only 1, and the ſquare of 2 is 4; therefore the ſquare of the period or revolution of the ball V is contained 4 times in the ſquare of the ball U. But the diſtance of V is 2, the cube of which is 8; and the diſtance of U is $3\frac{1}{3}$, the cube of which is 32 very nearly; in which 8 is contained four times; and therefore, the ſquares of the periods of V and U are to one another as the cubes of their diſtances from *x* and *w*, which are the centres of their reſpective circles. And if the weight in the tower O be four ounces, equal to the ſquare of 2, the diſtance of V from the centre *x*; and the weight in the tower P be 10 ounces, nearly equal to the ſquare of $3\frac{1}{3}$, the diſtance of U from *w*; it will be found, upon turning the machine by the winch, that the balls U and V will raiſe their reſpective weights at very nearly the ſame inſtant of time. Which confirms that famous propoſition of KEPLER, *viz.* That the ſquares of the periodical times of the planets round the ſun are in proportion to the cubes of their diſtances from him; and that the ſun's attraction is inverſely as the ſquare of the diſtance from its centre: that is, at twice the diſtance, his attraction is four times leſs; and thrice the diſtance, nine times leſs; at four times the diſtance, ſixteen times leſs; and ſo on, to the remoteſt part of the ſyſtem.

8. Take off the catgut ſtring E from the great wheel D and the ſmall wheel H, and let the ſtring F remain upon the wheels D and G. Take away alſo the bearer MX from the whirling-board *d*, and inſtead thereof put the machine AB (fig. 4.) upon it, fixing this machine to the centre of the board by the pins *c* and *d*, in ſuch a manner, that the end *ef* may riſe above the board to an angle of 30 or 40 degrees. In the upper ſide of this machine there are two glaſs tubes *a* and *b*, cloſe ſtopt at both ends; and each tube is about three quarters full of water. In the tube *a* is a little quickſilver, which naturally falls down to the end *a* in the water, becauſe it is heavier than its bulk of water; and on the tube *b* is a ſmall cork which floats upon the top of the water at *e*, becauſe it is lighter; and it is ſmall enough to have liberty to riſe or fall in the tube. While the board *b* with this machine upon it continues at reſt, the quickſilver lies at the bottom of the tube *a*, and the cork floats on the water near the top of the tube *b*. But, upon turning the winch, and putting the machine in motion, the contents of each tube will fly off towards the uppermoſt ends (which are fartheſt from the centre of motion) the heavieſt with the greateſt force. Therefore, the quickſilver in the tube *a* will fly off quite to the end *f*, and occupy its bulk of ſpace there, excluding the water from that place, becauſe it is lighter than quickſilver; but the water in the tube *b* flying off to its higher end *e*, will exclude the cork from that place, and cauſe the cork to deſcend towards the lowermoſt end of the tube, where it will remain upon the loweſt end of the water near *b*; for the heavier body having the greater centrifugal force, will therefore poſſeſs the uppermoſt part of the tube; and the lighter body will keep between the heavier and the lowermoſt part.

This demonſtrates the abſurdity of the Carteſian doctrine of the planets moving round the ſun in vortexes: for, if the planet be more denſe or heavy than the bulk of the vortex, it will fly off thereih, farther and farther from the ſun; if leſs denſe, it will come down to the loweſt part of the vortex, at the ſun: and the whole vortex itſelf muſt be ſurrounded with ſomething like a great wall, otherwiſe it would fly off, planets and all together.

But

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Plate CVI

Fig. 1.

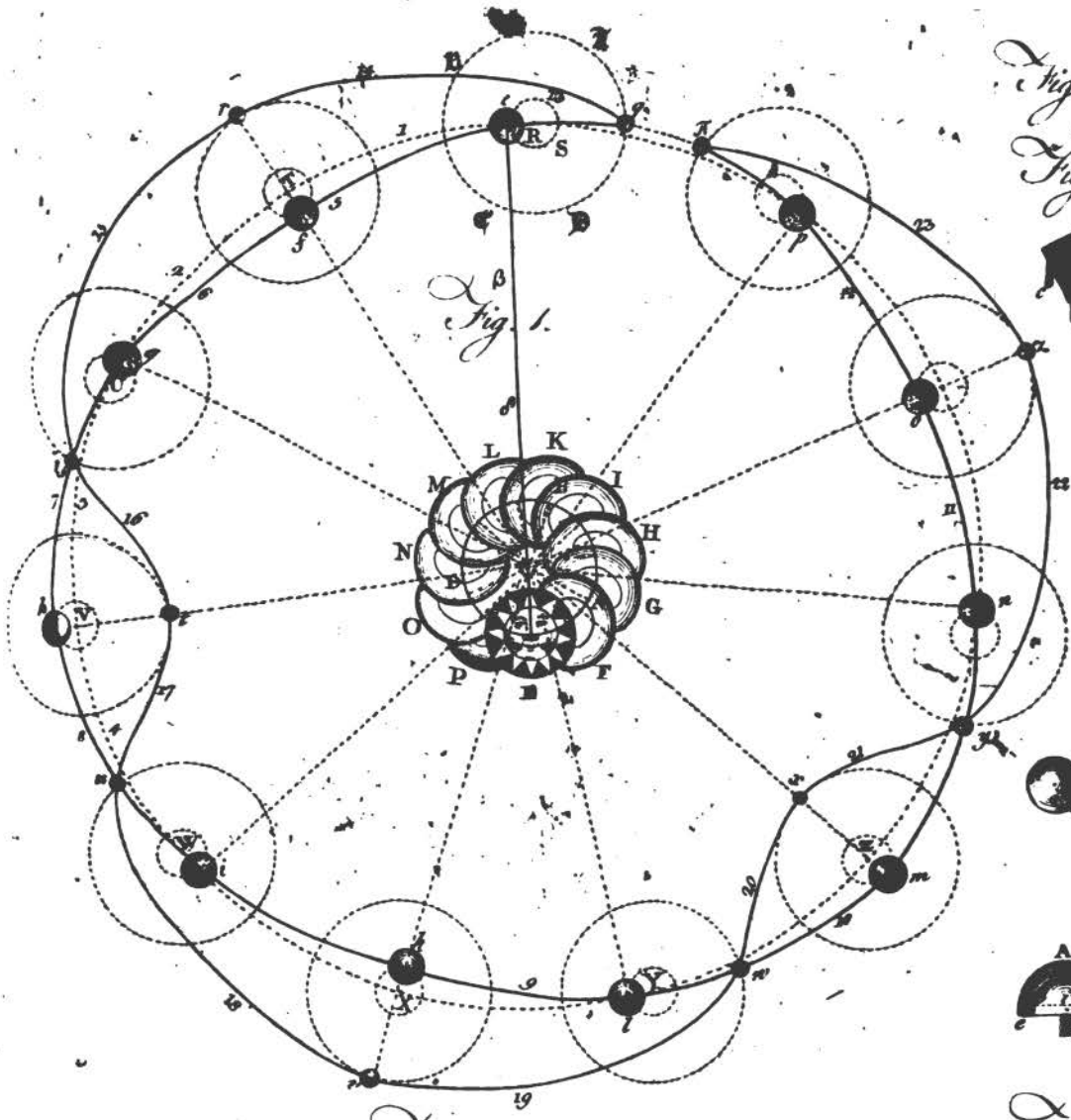

Fig. 3.

Fig. 4.

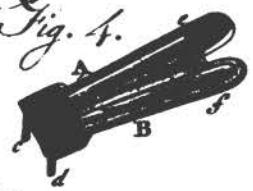

Fig. 6.

Fig. 7.

Fig. 5.

Fig. 2.

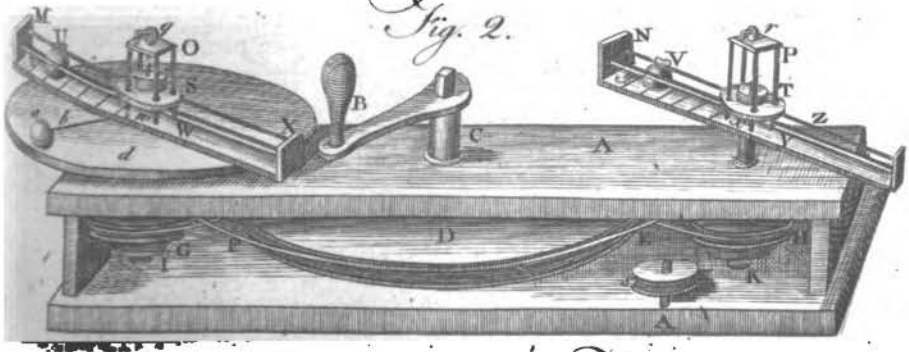

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 12.

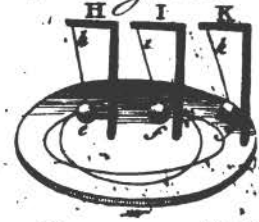

Fig. 11.

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But while gravity exiſts, there is no occaſion for ſuch vortexes; and when it ceaſes to exiſt, a ſtone thrown upwards will never return to the earth again.

9. If a body be ſo placed upon the whirling board of the machine (fig. 1.) that the centre of gravity of the body be directly over the centre of the board, and the board be put into ever ſo rapid a motion by the winch B, the body will turn round with the board, but will not remove from the middle of it: for, as all parts of the body are in *equilibrio* round its centre of gravity, and the centre of gravity is at reſt in the centre of motion, the centrifugal force of all parts of the body will be equal at equal diſtances from its centre of motion; and therefore the body will remain in its place. But if the centre of gravity be placed ever ſo little out of the centre of motion, and the machine be turned ſwiftly round, the body will fly off towards that ſide of the board on which its centre of gravity lies. Thus, if the wire C (fig. 5.) with its little ball B be taken away from the demi-globe A, and the flat ſide *ef* of this demi-globe be laid upon the whirling-board of the machine, ſo as their centres may coincide; if then the board be turned ever ſo quick by the winch, the demi globe will remain where it was placed. But if the wire C be ſcrewed in the demi-globe at *d*, the whole becomes one body, whoſe centre of gravity is now at or near *d*. Let the pin *c* be fixed in the centre of the whirling-board, and the deep groove *b* cut in the flat ſide of the demi-globe be put upon the pin, ſo as the pin may be in the centre of A [See fig. 6. where this groove is repreſented at *b*] and let the whirling board be turned by the winch, which will carry the little ball B (fig. 5.) with its wire C, and the demi-globe A, all round the centre-pin *ci*; and then the centrifugal force of the little ball B, which weighs only one ounce, will be ſo great, as to draw off the demi-globe A, which weighs two pounds, until the end of the groove at *e* ſtrikes againſt the pin *c*, and ſo prevents the demi-globe A from going any farther; otherwiſe, the centrifugal force of B would have been great enough to have carried A quite off the whirling-board. Which ſhews, that if the ſun were placed in the very centre of the orbits of the planets, it could not poſſibly remain there; for the centrifugal forces of the planets would carry them quite off, and the ſun with them; eſpecially when ſeveral of them happened to be in any one quarter of the heavens. For the ſun and planets are as much connected by the mutual attraction that ſubſiſts between them, as the bodies A and B are by the wire C which is fixed to them both. And even if there were but one ſingle planet in the whole heavens to go round ever ſo large a ſun in the centre of its orbit, its centrifugal force would ſoon carry off both itſelf and the ſun. For, the greateſt body placed in any part of free ſpace could be eaſily moved: becauſe if there were no other body to attract it, it could have no weight or gravity of itſelf; and conſequently, though it could have no tendency of itſelf to remove from that part of ſpace, yet it might be very eaſily by any other ſubſtance. And perhaps it was this conſideration which made the celebrated ARCHIMEDES ſay, that if he had a proper place at ſome diſtance from the earth whereon to fix his machinery, he could move the whole earth.

10. As the centrifugal force of the light body B will not allow the heavy body A to remain in the centre of motion, even though it be 24 times as heavy as B; let us now take the ball A (fig 7.) which weighs 6 ounces, and connect it by the wire C with the ball B, which weighs only one ounce; and let the fork E be fixed into the centre of the whirling-board; then, hang the balls upon the fork by the wire C in ſuch a manner that they may exactly balance each other; which will be when the centre of gravity between them, in the wire at *d*, is ſupported by the fork. And this centre of gravity is as much nearer to the centre of the ball A, than to the centre of the ball B, as A is heavier than B, allowing for the weight of the wire on each ſide of the fork. This done, let the machine be put into motion by the winch; and the balls A and B will go round their common centre of gravity *d*, keeping their balance, becauſe either will not allow the other to fly off with it. For, ſuppoſing the ball B to be only one ounce in weight, and the ball A to be ſix ounces; then, if the wire C were equally heavy on each ſide of the fork, the centre of gravity *d* would be ſix times as far from the centre of the ball B as from the centre of the ball A, and conſequently B will revolve with a velocity ſix times as great as A does; which will give B ſix times as much centrifugal force as any ſingle ounce of A has: but then, as B is only one ounce, and A ſix ounces, the whole centrifugal force of A will exactly balance the whole centrifugal force of B; and therefore, each body will detain the other ſo as to make it keep in its circle. This ſhews that the ſun and planets muſt all move round the common centre of gravity of the whole ſyſtem, in order to preſerve that juſt balance which takes place among them. For, the planets being as unactive and dead as the above balls, they could no more have put themſelves into motion than theſe balls can; nor have kept in their orbits, without being balanced at firſt with the greateſt degree of exactneſs upon their common centre of gravity by the Almighty Hand that made them and put them in motion.

Perhaps it may be here aſked, that ſince the centre of gravity between theſe balls muſt be ſupported by the fork E in this experiment, what prop it is that ſupports the centre of gravity of the ſolar ſyſtem, and conſequently bears the weight of all the bodies in it; and by what is the prop itſelf ſupported? The anſwer is eaſy and plain; for the centre of gravity of our balls muſt be ſupported, becauſe they gravitate towards the earth, and would therefore fall to it: but as the ſun and planets gravitate only towards one another, they have nothing elſe to fall to; and therefore have no occaſion for any thing to ſupport their common centre of gravity: and if they did not move round that centre, and conſequently acquire a tendency to fly of from it by their motions, their mutual attractions would ſoon bring them together; and ſo the whole would become one maſs in the ſun: which would alſo be the caſe if their velocities round the ſun were not quick enough to create a centrifugal force equal to the ſun's attraction.

But after all this nice adjuſtment, it appears evident, that the Deity cannot withdraw his regulating hand from his works, and leave them to be ſolely governed by the

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laws which he has impreſſed upon them at firſt. For if he ſhould once leave them ſo, their order would in time come to an end; becauſe the planets muſt neceſſarily diſturb one another's motions by their mutual attractions, when ſeveral of them are in the ſame quarter of the heavens; as is often the caſe: and then, as they attract the ſun more towards that quarter than when they are in a manner diſperſed equably arround him, if he was not at that time made to deſcribe a portion of a larger circle round the common centre of gravity, the balance would then be immediately deſtroyed; and as it could never reſtore itſelf again, the whole ſyſtem would begin to fall together, and would in time unite in a maſs at the ſun. —Of this diſturbance we have a very remarkable inſtance in the comet which appeared lately; and which, in going laſt up before from the ſun, went ſo near to Jupiter, and was ſo affected by his attraction, as to have the figure of its orbit much changed; and not only ſo, but to have its period altered, and its courſe to be different in the heavens from what it was laſt before.

11. Take away the fork and balls from the whirling-board, and place the trough AB (fig. 8.) thereon, fixing its centre to the centre of the whirling-board by the pin H. In this trough are two balls D and E, of unequal weights, connected by a wire *f*; and made to ſlide eaſily upon the wire C ſtretched from end to end of the trough, and made faſt by nut-ſcrews on the outſide of the ends. Let theſe balls be ſo placed upon the wire C, that their common centre of gravity *g* may be directly over the centre of the whirling board. Then, turn the machine by the winch ever ſo ſwiftly, and the trough and balls will go round their centre of gravity ſo as neither of them will fly off; becauſe, on account of the equilibrium, each ball detains the other with an equal force acting againſt it. But if the ball E be drawn a little more towards the end of the trough at A, it will remove the centre of gravity towards that end from the centre of motion; and then, upon turning the machine, the little ball E will fly off, and ſtrike with a conſiderable force againſt the end A, and draw the great ball B into the middle of the trough. Or, if the great ball D be drawn towards the end B of the trough, ſo that the centre of gravity may be a little towards that end from the centre of motion, and the machine be turned by the winch, the great ball D will fly off, and ſtrike violently againſt the end B of the trough, and will bring the little ball E into the middle of it. If the trough be not made very ſtrong, the ball D will break through it.

12. The reaſon why the tides riſe at the ſame abſolute time on oppoſite ſides of the earth, and conſequently in oppoſite directions, is made abundantly plain by a new experiment on the whirling table. The cauſe of their riſing on the ſide next the moon every one underſtands to be owing to the moon's attraction: but why they ſhould riſe on the oppoſite ſide at the ſame time, where there is no moon to attract them, is perhaps not ſo generally underſtood. For it would ſeem that the moon ſhould rather draw the waters (as it were) cloſer to that ſide, than raiſe them upon it, directly contrary to her attractive force. Let the circle *abcd* (fig. 9.) repreſent the earth, with its ſide *c* turned toward the moon, which will then attract the waters ſo as to raiſe them from *c* to *g*. But the queſtion is, why ſhould they riſe as high at that very time on the oppoſite ſide, from *a* to *e*? In order to explain this, let there be a plate AB (fig 10.) fixed upon one end of the flat bar DC; with ſuch a circle drawn upon it as *abcd* (in fig. 9.) to repreſent the round figure of the earth and ſea; and ſuch an ellipſis as *efgb* to repreſent the ſwelling of the tide at *e* and *g*, occaſioned by the influence of the moon. Over this plate AB let the three ivory balls *e*,*f*,*g* be hung by the ſilk lines *h*,*i*,*k*, faſtened to the tops of the crooked wires H,I,K, in ſuch a manner, that the ball at *e* may hang freely over the ſide of the circle *e*, which is fartheſt from the moon M (at the other end of the bar;) the ball at *f* may hang freely over the centre, and the ball at *g* hang over the ſide of the circle *g*, which is neareſt the moon. The ball *f* may repreſent the centre of the earth, the ball *g* ſome water on the ſide next the moon, and the ball *e* ſome water on the oppoſite ſide. On the back of the moon M is fixt the ſhort bar N parallel to the horizon, and there are three holes in it above the little weights *p*,*q*,*r*. A ſilk thread *o* is tied to the line *k* cloſe above the ball *g*, and, paſſing by one ſide of the moon M, goes through a hole in the bar N, and has the weight *p* hung to it. Such another thread *n* is tied to the line *i*, cloſe above the ball *f*, and, paſſing through the centre of the moon M and middle of the bar N, has the weight *q* hung to it, which is lighter than the weight *p*. A third thread *m* is tied to the line *h*, cloſe above the ball *e*, and paſſing by the other ſide of the moon M, through the bar N, has the weight *r* hung to it, which is lighter than the weight *q*.

The uſe of theſe three unequal weights is to repreſent the moon's unequal attraction at different diſtances from her. With whatever force ſhe attracts the centre of the earth, ſhe attracts the ſide next her with a greater degree of force, and the ſide fartheſt from her with a leſs. So, if the weights are left at liberty, they will draw all the three balls towards the moon with different degrees of force, and cauſe them to make the appearance ſhewn in (fig. 11.) by which means they are evidently farther from each other than they would be if they hung at liberty by the lines *h*,*i*,*k*; becauſe the lines would then hang perpendicularly. This ſhews, that as the moon attracts the ſide of the earth which is neareſt her with a greater degree of force than ſhe does the centre of the earth, ſhe will draw the water on that ſide more than ſhe draws the centre, and ſo cauſes it to riſe on that ſide: and as ſhe draws the centre more than ſhe draws the oppoſite ſide, the centre will recede farther from the ſurface of the water on that oppoſite ſide, and ſo leave it as high there as ſhe raiſed it on the ſide next to her. For, as the centre will be in the middle between the tops of the oppoſite elevations, they muſt of courſe be equally high on both ſides at the ſame time.

But upon this ſuppoſition the earth and moon would ſoon come together; and to be ſure they would, if they had not a motion round their common centre of gravity, to create a degree of centrifugal force ſufficient to balance their mutual attraction. This motion they have; for as the moon goes round her orbit every month, as the

the diſtance of 240000 miles from the earth's centre, and of 234000 miles from the centre of gravity of the earth and moon, ſo does the earth go round the ſame centre of gravity every month at the diſtance of 6000 miles from it; that is, from it to the centre of the earth. Now as the earth is (in round numbers) 8000 miles in diameter, it is plain that its ſide next the moon is only 2000 miles from the common centre of gravity of the earth and moon; its centre 6000 miles diſtant therefrom; and its fartheſt ſide from the moon 10000. Therefore the centrifugal forces of theſe parts are as 2000, 6000, and 10000; that is, the centrifugal force of any ſide of the earth, when it is turned from the moon, is five times as great as when it is turned towards the moon. And as the moon's attraction (expreſt by the number 6000) at the earth's centre keeps the earth from flying out of this monthly circle, it muſt be greater than the centrifugal force of the waters on the ſide next her; and conſequently, her greater degree of attraction on that ſide is ſufficient to raiſe them; but as her attraction on the oppoſite ſide is leſs than the centrifugal force of the water there, the exceſs of this force is ſufficient to raiſe the water juſt as high on the oppoſite ſide.—To prove this experimentally, let the bar DC (fig. 10.) with its furniture be fixed upon the whirling-board of the machine (fig. 2.) by puſhing the pin P into the centre of the board; which pin is in the centre of gravity of the whole bar with its three balls *e*, *f*, *g*, and moon M. Now, if the whirling-board and bar be turned ſlowly round by the winch, until the ball *f* hangs over the centre of the circle, as in fig. 11. the ball *g* will be kept towards the moon by the heavieſt weight *p*, (fig. 9.) and the ball *e*, on account of its greater centrifugal force, and the leſſer weight *r*, will fly off as far to the other ſide as in fig. 12. And ſo, whilſt the machine is kept turning, the balls *e* and *g* will hang over the ends of the ellipſis *l*, *f*, *k*. So that the centrifugal force of the ball *e* will exceed the moon's attraction juſt as much as her attraction exceeds the centrifugal force of the ball *g*, whilſt her attraction juſt balances the centrifugal force of the ball *f*, and makes it keep in its circle. And hence it is evident that the tides muſt riſe to equal heights at the ſame time on oppoſite ſides of the earth. This experiment, to the beſt of my knowledge, is entirely new.

From the principles thus eſtabliſhed, it is evident that the earth moves round the ſun, and not the ſun round the earth: for the centrifugal law will never allow a great body to move round a ſmall one in any orbit whatever; eſpecially when we find, that if a ſmall body moves round a great one, the great one muſt alſo move round the common centre of gravity between them two. And it is well known, that the quantity of matter in the ſun is 227000 times as great as the quantity of matter in the earth. Now, as the ſun's diſtance from the earth is at leaſt 81,000,000 of miles, if we divide that diſtance by 227000, we ſhall have only 357 for the number of miles that the centre of gravity between the ſun and earth is diſtant from the ſun's centre. And as the ſun's ſemidiameter is $\frac{1}{4}$ of a degree, which, at ſo great a diſtance as that of the ſun, muſt be no leſs than 381500 miles, if this be divided by 357, the quotient will be $1068\frac{3}{7}$, which ſhews that the common centre of gravity is within the body of the ſun, and is only the $1068\frac{3}{7}$ part of his ſemidiameter from his centre toward his ſurface.

All globular bodies, whoſe parts can yield, and which do not turn on their axes, muſt be perfect ſpheres, becauſe all parts of their ſurfaces are equally attracted toward their centres. But all ſuch globes which do turn on their axes, will be oblate ſpheroids; that is, their ſurfaces will be higher, or farther from the centre, in the equatorial than in the polar regions. For, as the equatorial parts move quickeſt, they muſt have the greateſt centrifugal force; and will therefore recede fartheſt from the axis of motion. Thus, if two circular hoops AB and CD, (Plate CVII. fig. 1.) made thin and flexible, and croſſing one another at right angles, be turned round their axis EF by means of the winch *m*, the wheel *n*, and pinion *o*, and the axis be looſe in the pole or interſection *e*, the middle parts A,B,C,D will ſwell out ſo as to ſtrike againſt the ſides of the frame at F and G, if the pole *e*, in ſinking to the pin E, be not kept by it from ſinking farther: ſo that the whole will appear of an oval figure, the equatorial diameter being conſiderably longer than the polar. That our earth is of this figure, is demonſtrable from actual meaſurement of ſome degrees on its ſurface, which are found to be longer in the frigid zones than in the torrid: and the difference is found to be ſuch as prove the earth's equatorial diameter to be 35 miles longer than its axis.—Since then, the earth is higher at the equator than at the poles, the ſea, which like all other fluids naturally runs downward (or towards the places which are neareſt the earth's centre) would run towards the polar regions, and leave the equatorial parts dry, if the centrifugal force of the water, which carried it to thoſe parts, and ſo raiſed them, did not detain and keep it from running back again towards the poles of the earth.

Of the Mechanical Powers.

In we conſider bodies in motion, and compare them together, we may do this either with reſpect to the quantities of matter they contain, or the velocities with which they are moved. The heavier any body is, the greater is the power required either to move it or to ſtop its motion: and again, the ſwifter it moves, the greater is its force. So that the whole *momentum* or quantity of force of a moving body is the reſult of its quantity of matter multiplied by the velocity with which it is moved. And when the products ariſing from the multiplication of the particular quantities of matter in any two bodies by their reſpective velocities are equal, the *momenta* or entire forces are ſo too. Thus, ſuppoſe a body, which we ſhall call A, to weigh 40 pounds, and to move at the rate of two miles in a minute; and another body, which we ſhall call B, to weigh only four pounds, and to move 20 miles in a minute; the entire forces with which theſe two bodies would ſtrike againſt any obſtacle would be equal to each other, and therefore it would require equal powers to ſtop them. For 40 multiplied by 2 gives 80, the force of the body A; and 20 multiplied by 4 gives 80, the force of the body B.

Upon this eaſy principle depends the whole of mechanics:

chanics: and it holds univerſally true, that when two bodies are ſuſpended by any machine, ſo as to act contrary to each other: if the machine be put into motion, and the perpendicular aſcent of one body multiplied into its weight, be equal to the perpendicular deſcent of the other body multiplied into its weight, theſe bodies, how unequal ſoever in their weights, will balance one another in all ſituations: for, as the whole aſcent of one is performed in the ſame time with the whole deſcent of the other, their reſpective velocities muſt be directly as the ſpaces they move through; and the exceſs of weight in one body is compenſated by the exceſs of velocity in the other.—Upon this principle it is eaſy to compute the power of any mechanical engine, whether ſimple or compound; for it is but only inquiring how much ſwifter the power moves than the weight does (*i. e.* how much farther in the ſame time,) and juſt ſo much is the power increaſed by the help of the engine.

In the theory of this ſcience, we ſuppoſe all planes perfectly even, all bodies perfectly ſmooth, levers to have no weight, cords to be extremely pliable, machines to have no friction; and in ſhort, all imperfection muſt be ſet aſide until the theory be eſtabliſhed, and then proper allowances are to be made.

The ſimple *machines*, uſually called *mechanical powers*, are ſix in number, viz. the *lever*, the *wheel and axle*, the *pulley*, the *inclined plane*, the *wedge*, and the *ſcrew*. They are called mechanical powers, becauſe they help us to raiſe weights, move heavy bodies, and overcome reſiſtances, which we could not effect without them.

1. A *lever* is a bar of iron or wood, one part of which being ſupported by a prop, all the other parts turn upon that prop as their centre of motion: and the velocity of every part or point is directly as its diſtance from the prop. Therefore, when the weight to be raiſed at one end is to the power applied at the other to raiſe it, as the diſtance of the power from the prop is to the diſtance of the weight from the prop, the power and weight will exactly balance or counterpoiſe each other: and as a common lever has but very little friction on its prop, a very little additional power will be ſufficient to raiſe the weight.

There are four kinds of levers. 1. The common ſort, where the prop is placed between the weight and the power; but much nearer to the weight than to the power. 2. When the prop is at one end of the lever, the power at the other, and the weight between them. 3. When the prop is at one end, the weight at the other, and the power applied between them. 4. The bended lever, which differs only in form from the firſt ſort, but not in property. Thoſe of the firſt and ſecond kind are often uſed in mechanical engines; but there are few inſtances in which the third ſort is uſed.

A *common balance* is a lever of the firſt kind; but as both its ends are at equal diſtances from its centre of motion, they move with equal velocities; and therefore, as it gives no mechanical advantage, it cannot properly be reckoned among the mechanical powers.

A lever of the firſt kind is repreſented by the bar ABC, (Plate CVII. fig. 2.) ſupported by the prop D. Its principal uſe is to looſen large ſtones in the ground, or raiſe great weights to ſmall heights, in order to have ropes put under them for raiſing them higher by other machines. The parts AB and BC, on different ſides of the prop D, are called the arms of the lever: the end A of the ſhorter arm AB being appplied to the weight intended to be raiſed, or to the reſiſtance to be overcome; and the power applied to the end C of the longer arm BC.

In making experiments with this machine, the ſhorter arm AB muſt be as much thicker than the longer arm BC, as will be ſufficient to balance it on the prop. This ſuppoſed, let P repreſent a power whoſe intenſity is equal to one ounce, and W a weight whoſe intenſity is equal to 12 ounces. Then, if the power be 12 times as far from the prop as the weight is, they will exactly counterpoiſe; and a ſmall addition to the power P will cauſe it to deſcend, and raiſe the weight W; and the velocity with which the power deſcends will be to the velocity with which the weight riſes, as 12 to 1: that is, directly as their diſtances from the prop; and conſequently, as the ſpaces through which they move Hence it is plain, that a man who by his natural ſtrength, without the help of any machine, could ſupoort an hundred weight, will by the help of this lever be enabled to ſupport twelve hundred. If the weight be leſs, or the power greater, the prop may be placed ſo much the farther from the weight; and then it can be raiſed to a proportionably greater height. For univerſally, if the intenſity of the weight multiplied into its diſtance from the prop be equal to the intenſity of the power multiplied into its diſtance from the prop, the power and weight will exactly balance each other; and a little addition to the power will raiſe the weight. Thus, in the preſent inſtance, the weight W is 12 ounces, and its diſtance from the prop is 1 inch; and 12 multiplied by 1 is 12; the power P is equal to 1 ounce, and its diſtance from the prop is 12 inches, which multiplied by one is 12 again: and therefore there is an equilibrium between them. So, if a power equal to 2 ounces be applied at the diſtance of 6 inches from the prop, it will juſt balance the weight W; for 6 multiplied by 2 is 12, as before. And a power equal to 3 ounces placed at 4 inches diſtance from the prop would do the ſame; for 3 times 4 is 12; and ſo on, in proportion.

The *ſtatera*, or Roman *ſteelyard*, is a lever of this kind, contrived for finding the weights of different bodies by one ſingle weight placed at different diſtances from the prop or centre of motion D. For, if a ſcale hangs at A, the extremity of the ſhorter arm AB, and is of ſuch a weight as will exactly counterpoiſe the longer arm BC; if this arm be divided into as many equal parts as it will contain, each equal to AB, the ſingle weight P (which we may ſuppoſe to be 1 pound) will ſerve for weighing any thing as heavy as itſelf, or as many times heavier as there are diviſions in the arm BC, or any quantity between its own weight and that quantity. As for example, if P be 1 pound, and placed at the firſt diviſion 1 in the arm BC, it will balance 1 pound in the ſcale at A: if it be removed to the ſecond diviſion at 2, it will balance 2 pounds in the ſcale; if to the third, 3 pounds: and ſo on to the end of the arm BC. If each of theſe integral diviſions be ſubdivided into as many equal parts as a pound contains ounces, and the weight

P

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P be placed at any of theſe ſubdiviſions, ſo as to counterpoiſe what is in the ſcale, the pounds and odd ounces therein are by that means aſcertained.

To this kind of lever may be reduced ſeveral ſorts of inſtruments, ſuch as ſciſſars, pinchers, ſnuffers; which are made of two levers acting contrary to one another; their prop or centre of motion being the pin which keeps them together.

In common practice, the longer arm of this lever greatly exceeds the weight of the ſhorter; which gains great advantage, becauſe it adds ſo much to the power.

A lever of the ſecond kind has the weight between the prop and the power. In this, as well as the former, the advantage gained is as the diſtance of the power from the prop to the diſtance of the weight from the prop: for the reſpective velocities of the power and weight are in that proportion; and they will balance each other when the intenſity of the power multiplied by its diſtance from the prop is equal to the intenſity of the weight multiplied by its diſtance from the prop. Thus, if AB (fig. 3.) be a lever on which the weight W of 6 ounces hangs at the diſtance of 1 inch from the prop G, and a power P equal to the weight of one ounce hangs at the end B, 6 inches from the prop, by the cord CD going over the fixed pulley E, the power will juſt ſupport the weight; and a ſmall addition to the power will raiſe the weight 1 inch for every 6 inches that the power deſcends.

This lever ſhews the reaſon why two men carrying a burden upon a ſtick between them, bear unequal ſhares of the burden in the inverſe proportion of their diſtances from it. For it is well known, that the nearer any of them is to the burden, the greater ſhare he bears of it: and if he goes directly under it, he bears the whole. So, if one man be at G, and the other at P, having the pole or ſtick AB reſting on their ſhouldets; if the burden or weight W be placed five times as near the man at G, as it is to the man at P, the former will bear five times as much weight as the latter. This is likewiſe applicable to the caſe of two horſes of unequal ſtrength, to be ſo yoked, as that each horſe may draw a part proportionable to his ſtrength; which is done by dividing the beam ſo, that the point of traction may be as much nearer to the ſtronger horſe than to the weaker, as the ſtrength of the former exceeds that of the latter.

To this kind of lever may be reduced oars, rudders of ſhips, doors turning upon hinges, cutting knives which are fixed at the point of the blade, and the like.

If in this lever we ſuppoſe the power and weight to change places, ſo that the power may be between the weight and the prop, it will become a lever of the third kind; in which, that there may be a balance between the power and the weight, the intenſity of the power muſt exceed the intenſity of the weight, juſt as much as the diſtance of the weight from the prop exceeds the diſtance of the power from it. Thus, let E (fig. 4.) be the prop of the lever AB, and W a weight of 1 pound, placed 3 times as far from the prop, as the power P acts at F, by the cord C going over the fixed pulley D; in this caſe, the power muſt be equal to three pounds, in order to ſupport the weight.

To this ſort of lever are generally referred the bones of a man's arm: for when we lift a weight by the hand, the muſcle that exerts its force to raiſe that weight, is fixed to the bone about one tenth part as far below the elbow as the hand is. And the elbow being the centre round which the lower part of the arm turns, the muſcle muſt therefore exert a force ten times as great as the weight that is raiſed.

As this kind of lever is a diſadvantage to the moving power, it is never uſed but in caſes of neceſſity; ſuch as that of a ladder, which, being fixed at one end, is by the ſtrength of a man's arms reared againſt a wall; and in clock-work, where all the wheels may be reckoned levers of this kind, becauſe the power that moves every wheel, except the firſt, acts upon it near the centre of motion by means of a ſmall pinion, and the reſiſtance it has to overcome acts againſt the teeth round its circumference.

The fourth kind of lever differs nothing from the firſt, but in being bended for the ſake of convenience. ACB (fig. 5.) is a lever of this ſort, bended at C, which is its prop, or centre of motion. P is a power acting upon the longer arm AC at F, by means of the cord DE going over the pulley G; and W is a weight or reſiſtance acting upon the end B of the ſhorter arm BC. If the power be to the weight as BC is to CF, they are in *equilibrio*. Thus, ſuppoſe W to be 5 pounds acting at the diſtance of one foot from the centre of motion C, and P to be 1 pound acting at F, five feet from the centre C, the power and weight will juſt balance each other. A hammer drawing a nail is a lever of this ſort.

2. The ſecond mechanical power is the *wheel and axle*, in which the power is applied to the circumference of the wheel, and the weight is raiſed by a rope which coils about the axle as the wheel is turned round. Here it is plain, that the velocity of the power muſt be to the velocity of the weight, as the circumference of the wheel is to the circumference of the axle: and conſequently, the power and weight will balance each other, when the intenſity of the power is to the intenſity of the weight as the circumference of the axle is to the circumference of the wheel. Let AB (fig. 6.) be a wheel, CD its axle, and ſuppoſe the circumference of the wheel to be 8 times as great as the circumference of the axle; then a power P equal to 1 pound hanging by the cord I, which goes round the wheel, will balance a weight W of 8 pounds hanging by the rope K which goes round the axle. And as the friction on the pivots or gudgeons of the axle is but ſmall, a ſmall addition to the power will cauſe it to deſcend, and raiſe the weight: but the weight will riſe with only an eighth part of the velocity wherewith the power deſcends, and conſequently through no more than an eighth part of an equal ſpace, in the ſame time. If the wheel be pulled round by the handles S,S, the power will be increaſed in proportion to their length. And by this means, any weight may be raiſed as high as the operator pleaſes.

To this ſort of engine belong all cranes for raiſing great weights; and in this caſe, the wheel may have cogs all around it inſtead of handles, and a ſmall lantern or trundle may be made to work in the cogs, and be turned

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by a winch; which will make the power of the engine to exceed the power of the man who works it, as much as the number of revolutions of the winch exceed thoſe of the axle D, when multiplied by the exceſs of the length of the winch above the length of the ſemidiameter of the axle, added to the ſemidiameter or half-thickneſs of the rope K, by which the weight is drawn up. Thus, ſuppoſe the diameter of the rope and axle taken together to be 12 inches, and conſequently half their diameters to be 6 inches; ſo that the weight W will hang at 6 inches perpendicular diſtance from below the centre of the axle. Now, let us ſuppoſe the wheel AB, which is fixt on the axle, to have 80 cogs, and to be turned by means of a winch ſix inches long, fixt on the axis of a trundle of 8 ſtaves or rounds, working in the cogs of the wheel.—Here it is plain, that the winch and trundle would make 10 revolutions for one of the wheel AB, and its axis D, on which the rope K winds in raiſing the weight W; and the winch being no longer than the ſum of the ſemi-diameters of the great axle and rope, the trundle could have no more power on the wheel, than a man could have by pulling it round by the edge, becauſe the winch would have no greater velocity than the edge of the wheel has, which we here ſuppoſe to be ten times as great as the velocity of the riſing weight; ſo that, in this caſe, the power gained would be as 10 to 1. But if the length of the winch be 12 inches, the power gained will be as 20 to 1: if 18 inches (which is long enough for any man to work by) the power gained would be as 30 to 1; that is, a man could raiſe 30 times as much by ſuch an engine, as he could do by his natural ſtrength without it, becauſe the velocity of the handle of the winch would be 30 times as great as the velocity of the riſing weight; the abſolute force of any engine being in proportion of the velocity of the power to the velocity of the weight raiſed by it.—But then, juſt as much power or advantage as is gained by the engine, ſo much time is loſt in working it. In this ſort of machines it is requiſite to have a ratchet-wheel G on one end of the axle, with a catch H to fall into its teeth; which will at any time ſupport the weight, and keep it from deſcending, if the workman ſhould, through inadvertency or careleſneſs, quit his hold whilſt the weight is raiſing. And by this means, the danger is prevented which might otherwiſe happen by the running down of the weight when left at liberty.

3. The third mechanical power or engine conſiſts either of one *moveable pulley*, or a *ſyſtem of pulleys*; ſome in a block or caſe which is fixed, and others in a block which is moveable, and riſes with the weight. For tho' a ſingle pulley, that only turns on its axis, and riſes not with the weight, may ſerve to change the direction of the power, yet it can give no mechanical advantage thereto; but is only as the beam of a balance, whoſe arms are of equal length and weight. Thus, if the equal weights W and P (fig. 7.) hang by the cord BB upon the pulley A, whoſe block *b* is fixed to the beam HI, they will counterpoiſe each other, juſt in the ſame manner as if the cord were cut in the middle, and its two ends hung upon the hooks fixt in the pulley at A and A, equally diſtant from its centre.

But if a weight W hangs at the lower end of the moveable block *p* of the pulley D, and the cord GF goes under the pulley, it is plain that the half G of the cord bears one half of the weight W, and the half F the other; for they bear the whole between them. Therefore, whatever holds the upper end of either rope, ſuſtains one half of the weight; and if the cord at F be drawn up ſo as to raiſe the pulley D to C, the cord will then be extended to its whole length, all but that part which goes under the pulley: and conſequently, the power that draws the cord will have moved twice as far as the pulley D with its weight W riſes: on which account, a power whoſe intenſity is equal to one half of the weight will be able to ſupport it, becauſe if the power moves (by means of a ſmall addition) its velocity will be double the velocity of the weight; as may be ſeen by putting the cord over the fixt pulley C (which only changes the direction of the power, without giving any advantage to it) and hanging on the weight P, which is equal only to one half of the weight W; in which caſe there will be an equilibrium, and a little addition to P will cauſe it to deſcend, and raiſe W through a ſpace equal to one half of that through which P deſcends.—Hence, the advantage gained will be always equal to twice the number of pulleys in the moveable or undermoſt block. So that, when the upper or fixt block *n* contains two pulleys, which only turn on the axes, and the lower or moveable block U contains two pulleys, which not only turn upon their axes, but alſo riſe with the block and weight; the advantage gained by this is as 4 to the working power. Thus, if one end of the rope KMOQ be fixed to a hook at I, and the rope paſſes over the pulleys N and R, and under the pulleys L and P, and has a weight T, of one pound, hung to its other end at T, this weight will balance and ſupport a weight W of four pounds hanging by a hook at the moveable block U, allowing the ſaid block as a part of the weight. And if as much more power be added as is ſufficiennt to overcome the friction of the pulleys, the power will deſcend with four times as much velocity as the weight riſes, and conſequently through four times as much ſpace.

The two pulleys in the fixed block X, and the two in the moveable block Y, are in the ſame caſe with thoſe laſt mentioned; and thoſe in the lower block give the ſame advantage to the power.

As a ſyſtem of pulleys has not great weight and lies in a ſmall compaſs, it is eaſily carried about: and can be applied, in a great many caſes, for raiſing weights, where other engines cannot. But they have a great deal of friction, on three accounts: 1. Becauſe the diameters of their axes bear a very conſiderable proportion to their own diameters; 2. Becauſe in working they are apt to rub againſt one another, or againſt the ſides of the block; 3. Becauſe of the ſtiffneſs of the rope that goes over and under them.

4. The fourth mechanical power is the *inclined plane*; and the advantage gained by it is as great as its length exceeds its perpendicular height. Let AB (fig. 8.) be a plane parallel to the horizon, and CD a plane inclined to it; and ſuppoſe the whole length CD to be three times as great as the perpendicular height G*f*F: in this caſe, the cylinder E will be ſupported upon the plane CD, and kept

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Fig. 1.

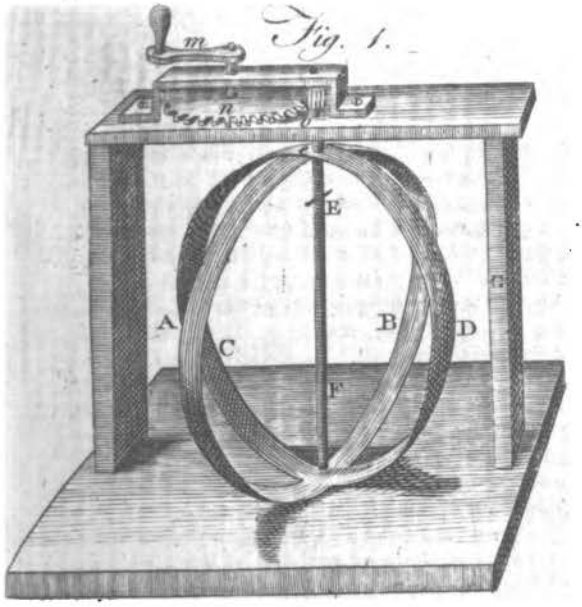


Fig. 2.

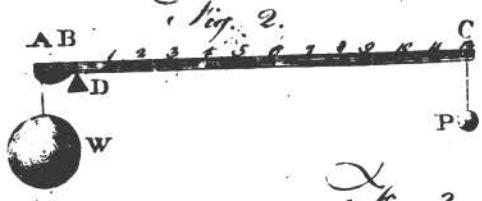
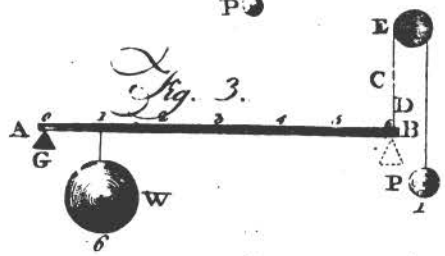


Fig. 3.



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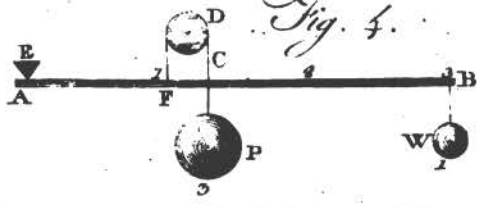

Fig. 5.

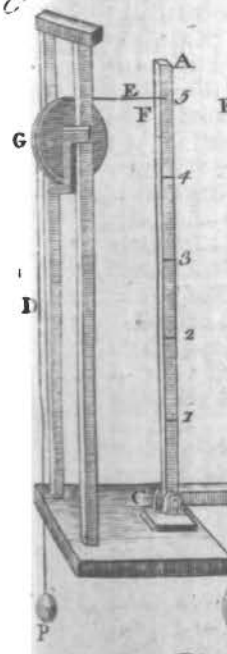

Fig. 6.

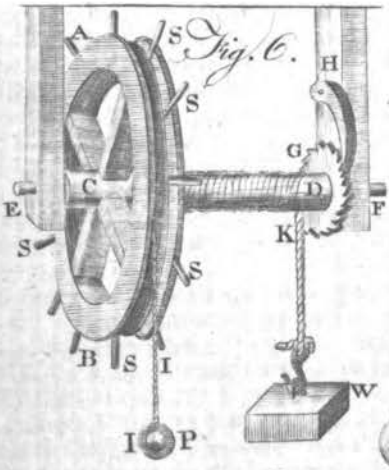

Fig. 7.

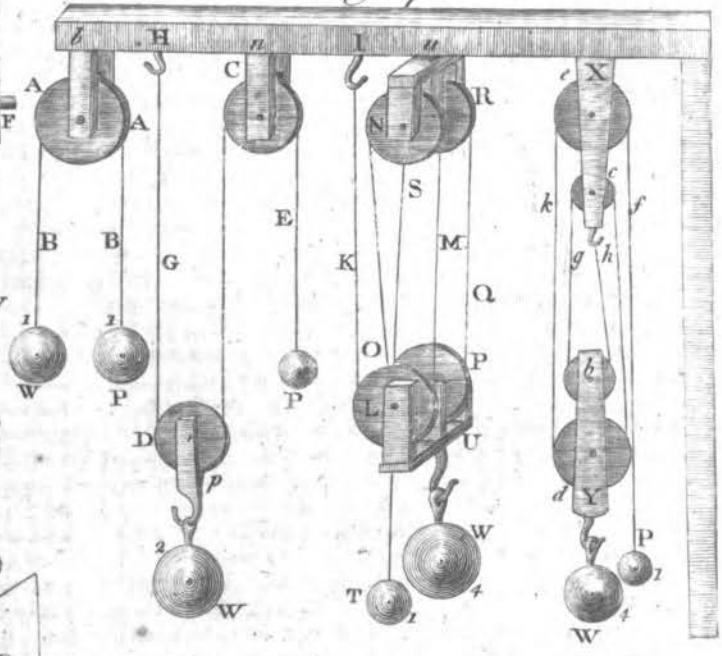

Fig. 8.

Fig. 13.

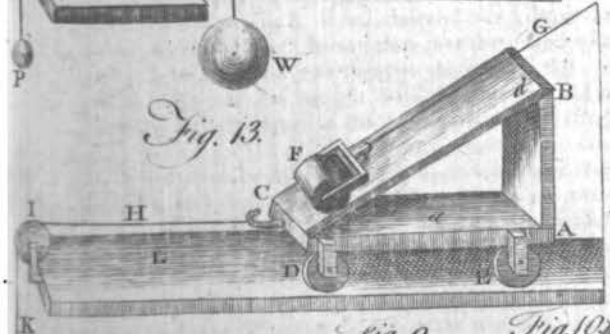

Fig. 11.

Fig. 12.

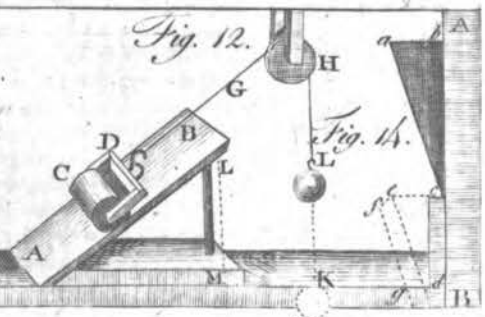

Fig. 14.

Fig. 9.

Fig. 10.

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kept from rolling down upon it, by a power equal to a third part of the weight of the cylinder. Therefore, a weight may be rolled up this inclined plane with a third part of the power which would be ſufficient to draw it up by the ſide of an upright wall. If the plane was four times as long as high, a fourth part of the power would be ſufficient; and ſo on, in proportion. Or, if a pillar was to be raiſed from a floor to the height GF, by means of the engine ABDC, (which would then act as a half wedge, where the reſiſtance gives way only on one ſide) the engine and pillar would be in *equilibrio* when the power applied at GF was to the weight of the pillar as GF to GD; and if the power be increaſed, ſo as to overcome the friction of the engine againſt the floor and pillar, the engine will be driven, and the pillar raiſed: and when the engine has moved its whole length upon the floor, the pillar will be raiſed to the whole height of the engine, from G to F.

The force wherewith a rolling body deſcends upon an inclined plane, is to the force of its abſolute gravity, by which it would deſcend perpendicularly in a free ſpace, as the height of the plane is to its length. For, ſuppoſe the plane AB (fig. 9.) to be parallel to the horizon, the cylinder C will keep at reſt upon any part of the plane where it is laid. If the plane be ſo elevated, that its perpendicular height D (fig. 10.) is equal to half its length AB, the cylinder will roll down upon the plane with a force equal to half its weight; for it would require a power (acting on the direction of AB) equal to half its weight, to keep it from rolling. If the plane AB (fig. 11.) be elevated, ſo as to be perpendicular to the horizon, the cylinder C will deſcend with its whole force of gravity. becauſe the plane contributes nothing to its ſupport or hindrance; and therefore, it would require a power equal to its whole weight to keep it from deſcending.

Let the cylinder C (fig. 12.) be made to turn upon ſlender pivots in the frame D, in which there is a hook *e*, with a line G tied to it: let this line go over the fixed pulley H, and have its other end tied to a hook in the weight I. If the weight of the body I, be to the weight of the cylinder C, added to that of its frame D, as the perpendicular height of the plane LM is to its length AB, the weight will juſt ſupport the cylinder upon the plane, and a ſmall touch of a finger will either cauſe it to aſcend or deſcend with equal eaſe: then, if a little addition be made to the weight I, it will deſcend, and draw the cylinder up the plane. In the time that the cylinder moves from A to B, it will riſe through the whole height of the plane ML; and the weight will deſcend from H to K, through a ſpace equal to the whole length of the plane AB.

If the plane be made to move upon rollers or friction-wheels, and the cylinder be ſupported upon it; the ſame power will draw the plane under the cylinder, which before drew the cylinder up the plane, provided the pivots of the axes of the friction-wheels be ſmall, and the wheels themſelves be pretty large. For, let the machine ABC (fig. 13.) (equal in length and height to ABM, fig. 12.) be provided with four wheels, whereof two appear at D and E, and the third under C, whilſt the fourth is hid from ſight by the horizontal board *a*. Let the cylinder F be laid upon the lower end of the inclined plane CB, and the line G be extended from the frame of the cylinder, about ſix feet parallel to the plane CB; and, in that direction, fixed to a hook in the wall; which will ſupport the cylinder, and keep it from rolling off the plane. Let one end of the line H be tied to a hook at C in the machine, and the other end to a weight K, the ſame as drew the cylinder up the plane before. If this line be put over the fixed pully I, the weight K will draw the machine along the horizontal plane L, and under the cylinder F: and when the machine has been drawn the whole length CB, the cylinder will be raiſed to *d*, equal to the perpendicular height AB above the horizontal part at A.

To the inclined plane may be reduced all hatchets, chiſels, and other edge tools which are chamfred only on one ſide.

5. The fifth mechanical power or engine is the *wedge*, which may be conſidered as two equally inclined planes DEF and CEF, joined together at their baſes *e* EF: then DC (Plate CVIII. fig. 1.) is the whole thickneſs of the wedge at its back ABCD, where the power is applied; EF is the depth or height of the wedge; DF the length of one of its ſides, equal to CF the length of the other ſide; and OF is its ſharp edge, which is entered into the wood intended to be ſplit by the force of a hammer or mallet ſtriking perpendicularly on its back. Thus, AB*b* (fig. 2.) is a wedge driven into the cleft CDE of the wood FG.

When the wood does not cleave at any diſtance before the wedge, there will be an equilibrium between the power impelling the wedge downward, and the reſiſtance of the wood acting againſt the two ſides of the wedge; if the power be to the reſiſtance, as half the thickneſs of the wedge at its back is to the length of either of its ſides; that is, as A*a* to A*b*, or B*a* to B*b* (fig. 2.) And if the power be increaſed, ſo as to overcome the friction of the wedge and the reſiſtance ariſing from the cohenon or ſtickage of the wood, the wedge will be drove in, and the wood ſplit aſunder,

But, when the wood cleaves at any diſtance before the wedge (as it generally does) the power impelling the wedge will not be to the reſiſtance of the wood, as half the thickneſs of the wedge is to the length of one of its ſides; but as half its thickneſs is to the length of either ſide of the cleft, eſtimated from the top or acting part of the wedge. For, if we ſuppoſe the wedge to be lengthened down from *b* to the bottom of the cleft at E, the ſame proportion will hold; namely, that the power will be to the reſiſtance, as half the thickneſs of the wedge is to the length of either of its ſides: or, which amounts to the ſame thing, as the whole thickneſs of the wedge is to the length of both its ſides.

In order to prove what is here advanced concerning the wedge, let us ſuppoſe the wedge to be divided lengthwiſe into two equal parts: and then it will become two equally inclined planes; one of which, as *abc*, (Plate CVII. fig. 14.) may be made uſe of as a half wedge for ſeparating the moulding *cd* from the wainſcot AB. It is evident, that when this half-wedge has been driven its whole length *ac* between the wainſcot and moulding, its ſide *ac* will be at *ed*; and the moulding will be ſeparated

to

to *fg* from the wainſcot. Now, from what has been already proved of the inclined plane, it appears, that to have an equilibrium between the power impelling the half wedge and the reſiſtance of the moulding, the former muſt be to the latter as *ab* to *ac*; that is, as the thickneſs of the back which receives the ſtroke is to the length of the ſide againſt which the moulding acts. Therefore, ſince the power upon the half wedge is to the reſiſtance againſt its ſide, as the half back *ab* is to the whole ſide *ac*, it is plain, that the power upon the whole wedge (where the whole back is double the half back) muſt be to the reſiſtance againſt both its ſides, as the thickneſs of the whole back is to the length of both the ſides, ſuppoſing the wedge at the bottom of the cleft; or as the thickneſs of the whole back to the length of both ſides of the cleft, when the wood ſplits at any diſtance before the wedge. For, when the wedge is driven quite into the wood, and the wood ſplits at ever ſo ſmall a diſtance before its edge, the top of the wedge then becomes the acting part, becauſe the wood does not touch it any where elſe. And ſince the bottom of the cleft muſt be conſidered as that part where the whole ſtickage or reſiſtance is accumulated, it is plain, from the nature of the lever, that the farther the power acts from the reſiſtance, the greater is the advantage.

Some writers have advanced, that the power of the wedge is to the reſiſtance to be overcome, as the thickneſs of the back of the wedge is to the length only of one of its ſides; which ſeems very ſtrange: for, if we ſuppoſe AB (Plate CVIII. fig 3.) to be a ſtrong inflexible bar of wood or iron fixt into the ground at CB, and D and E to be two blocks of marble lying on the ground on oppoſite ſides of the bar, it is evident that the block D may be ſeparated from the bar to the diſtance *d*, equal to *ab*, by driving the inclined plane or half wedge *abo* down between them; and the block E may be ſeparated to an equal diſtance on the other ſide, in like manner, by the half wedge *edo*. But the power impelling each half wedge will be to the reſiſtance of the block againſt its ſide, as the thickneſs of that half wedge is to the length of its acting ſide. Therefore the power to drive both the half wedges is to both the reſiſtances, as both the half backs is to the length of both the acting ſides, or as half the thickneſs of the whole back is to the length of either ſide. And, if the bar be taken away, the blocks put cloſe together, and the two half wedges joined to make one; it will require as much force to drive it down between the blocks, as is equal to the ſum of the ſeparate powers acting upon the half wedges when the bar was between them.

To confirm this by an experiment, let two cylinders, as AB (fig. 4.) and CD, be drawn towards one another by lines running over fixed pulleys, and a weight of 40 ounces hanging at the lines belonging to each cylinder: and let a wedge of 40 ounces weight, having its back juſt as thick as either of its ſides is long, be put between the cylinders, which will then act againſt each ſide with a reſiſtance equal to 40 ounces, whilſt its own weight endeavours to bring it down and ſeparate them. And here, the power of the wedge's gravity impelling it downward, will be to the reſiſtance of both the cylinders againſt the wedge, as the thickneſs of the wedge is to the length of both its ſides; for there will then be an equilibrium between the weight of the wedge and the reſiſtance of the cylinders againſt it, and it will remain at any height between them; requiring juſt as much power to puſh it upward as to pull it downward.—If another wedge of equal weight and depth with this, and only half as thick, be put between the cylinders, it will require twice as much weight to be hung at the ends of the lines which draw them together, to keep the wedge from going down between them. That is, a wedge of 40 ounces, whoſe back is only equal to half the length of one of its ſides, will require 80 ounces to each cylinder, to keep it in an equilibrium between them: and twice 80 is 160, equal to four times 40. So that the power will be always to the reſiſtance, as the thickneſs of the back of the wedge is to the length (not of its one ſide, but) of both its ſides.

The beſt way, though perhaps not the neateſt, for making a wedge with its appurtenances for ſuch experiments, is as follows. Let IKLM (fig. 4.) and LMNO be two flat pieces of wood, each about fifteen inches long and three or four in breadth, joined together by a hinge at LM; and let P be a graduated arch of braſs, on which the ſaid pieces of wood may be opened to any angle not more than 60 degrees, and then fixt at the given angle by means of the two ſcrews *a* and *b*. Then, IKNO will repreſent the back of the wedge, LM its ſharp edge which enters the wood, and the outſides of the pieces IKLM and LMNO the two ſides of the wedge againſt which the wood acts in cleaving. By means of the ſaid arch, the wedge may be opened ſo as to adjuſt the thickneſs of its back in any proportion to the length of either of its ſides, but not to exceed that length: and any weight, as *p*, may be hung to the wedge upon the hook M, which weight, together with the weight of the wedge itſelf, may be conſidered as the impelling power; which is all the ſame in experiment, whether it be laid upon the back of the wedge to puſh it down, or hung to its edge to pull it down.—Let AB and CD be two wooden cylinders, each about two inches thick, where they touch the outſides of the wedge; and let their ends be made like two round flat plates, to keep the wedge from ſlipping off endwiſe between them. Let a ſmall cord with a loop on one end of it go over a pivot in the end of each cylinder, and the cords S and T belonging to the cylinder AB go over the fixt pulleys W and X, and be faſtened at their other ends to the bar *wx*, on which any weight, as Z, may be hung at pleaſure. In like manner, let the cords Q and R belonging to the cylinder BC go over the fixt pulleys U and V to the bar *uv*, on which a weight Y equal to Z may be hung. Theſe weights, by drawing the cylinders towards one another, may be conſidered as the reſiſtance of the wood acting equally againſt oppoſite ſides of the wedge; the cylinders themſelves being ſuſpended near and parallel to each other, by their pivots in loops on the lines E,F,G,H; which lines may be fixed to hooks in the cieling of the room. The longer theſe lines are, the better; and they ſhould never be leſs than four feet each. The further alſo the pulleys W,V and W,X are from the cylinders, the truer will the experiments be; and they may turn upon pins fixed into the wall.

In this machine, the weights Y and Z, and the weight *p*, may be varied at pleaſure, ſo as to be adjuſted in proportion

portion of the length of the wedge's ſide to the thickneſs of its back, and when they are ſo adjuſted, the wedge will be in *equilibrio* with the reſiſtance of the cylinders.

The wedge is a very great mechanical power, ſince not only wood but even rocks can be ſplit by it; which would be impoſſible to effect by the lever, wheel and axle, or pulley: for the force of the blow, or ſtroke, ſhakes the cohering parts, and thereby makes them ſeparate the more eaſily.

6. The ſixth and laſt mechanical power is the *ſcrew*; which cannot properly be called a ſimple machine, becauſe it is never uſed without the application of a lever or winch to aſſiſt in turning it: and then it becomes a compound engine of a very great force either in preſſing the parts of bodies cloſe together, or in raiſing great weights. It may be conceived to be made by cutting a piece of paper ABC (fig. 5.) into the form of an inclined plane or half wedge, and then coiling it round a cylinder AB (fig. 6.) And here it is evident, that the winch E muſt turn the cylinder once round before the weight or reſiſtance D can be moved from one ſpiral winding to another, as from *d* to *e*: therefore, as much as the circumference of a circle deſcribed by the handle of the winch is greater than the interval or diſtance between the ſpirals, ſo much is the force of the ſcrew. Thus, ſuppoſing the diſtance between the ſpirals to be half an inch, and the length of the winch to be twelve inches; the circle deſcribed by the handle of the winch where the power acts will be 76 inches nearly, or about 152 half inches, and conſequently 152 times as great as the diſtance between the ſpirals: and therefore, a power at the handle, whoſe intenſity is equal to no more than a ſingle pound, will balance 152 pounds acting againſt the ſcrew; and as much additional force, as is ſufficient to overcome the friction, will raiſe the 152 pounds; and the velocity of the power will be to the velocity of the weight, as 152 to 1. Hence it appears, that the longer the winch be made, and the nearer the ſpirals are to one another, ſo much the greater is the force of the ſcrew.

A machine for ſhewing the force or power of the ſcrew may be contrived in the following manner. Let the wheel C (fig. 7.) have a ſcrew *ab* on its axis, working in the teeth of the wheel D, which ſuppoſe to be 48 in number. It is plain, that for every time the wheel C and ſcrew *ab* are turned round by the winch A, the wheel D will be moved one tooth by the ſcrew; and therefore, in 48 revolutions of the winch, the wheel D will be turned once round. Then, if the circumference of a circle deſcribed by the handle of the winch be equal to the circumference of a groove *e* round the wheel D, the velocity of the handle will be 48 times as great as the velocity of any given point in the groove. Conſequently; if a line G (above number 48) goes round the groove *e*, and has a weight of 48 pounds hung to it below the pedeſtal EF, a power equal to one pound at the handle will balance and ſupport the weight. To prove this by experiment, let the circumferences of the grooves of the wheels C and D be equal to one another; and then if a weight H of one pound be ſuſpended by a line going round the groove of the wheel C, it will balance a weight of 48 pounds hanging by the line G; and a ſmall addition to the weight H will cauſe it to deſcend, and ſo raiſe up the other weight.

If the line G, inſtead of going round the groove *e* of the wheel D, goes round its axle I; the power of the machine will be as much increaſed, as the circumference of the groove *e* exceeds the circumference of the axle: which, ſuppoſing it to be ſix times, then one pound at H will balance 6 times 48, or 288 pounds hung to the line on the axle: and hence the power or advantage of this machine will be as 288 to 1. That is to ſay, a man, who by his natural ſtrength could lift an hundred weight, will be able to raiſe 288 hundred, or $14\frac{4}{10}$ ton weight by this engine.

But the following engine is ſtill more powerful, on account of its having the addition of four pulleys: and in it we may look upon all the mechanical powers combined together, even if we take in the balance. For as the axis D (fig. 8.) of the bar AB is in its middle at C, it is plain that if equal weights are ſuſpended upon any two pins equidiſtant from the axis C, they will counterpoiſe each other.—It becomes a lever by hanging a ſmall weight P upon the pin *n*, and a weight as much heavier upon either of the pins *b*, *c*, *d*, *e*, or *f*, as is in proportion to the pins being ſo much nearer the axis. The wheel and axle FG is evident; ſo is the ſcrew E, which takes in the inclined plane, and with it the half wedge. Part of a cord goes round the axle, the reſt under the lower pulleys K, *m*, over the upper pulleys L, *n*, and then it is tied to a hook at *m* in the lower or moveable block, on which hangs the weight W.

In this machine, if the wheel F has 30 teeth, it will be turned once round in thirty revolutions of the bar AB, which is fixt on the axis D of the ſcrew E: if the length of the bar is equal to twice the diameter of the wheel, the pins *a* and *n* at the ends of the bar will move 60 times as faſt as the teeth of the wheel do: and conſequently, one ounce at P will balance 60 ounces hung upon a tooth at *q* in the horizontal diameter of the wheel. Then, if the diameter of the wheel F is 10 times as great as the diameter of the axle G, the wheel will have 10 times the velocity of the axle; and therefore one ounce P at the end of the lever AC will balance 10 times 60 or 6000 ounces hung to the rope H which goes round the axle. Laſtly, if four pulleys be added, they will make the velocity of the lower block K, and weight W, four times leſs than the velocity of the axle: and this being the laſt power in the machine, which is four times as great as that gained by the axle, it makes the whole power of the machine 4 times 600, or 2400. So that a man who could lift one hundred weight in his arms, by his natural ſtrength, would be able to raiſe 2400 hundred weight by this engine.—But it is here as in all other mechanical caſes; for the time loſt is always as much as the power gained, becauſe the velocity with which the power moves will ever exceed the velocity with which the weight riſes, as much as the intenſity of the weight exceeds the intenſity of the power.

The friction of the ſcrew itſelf is very conſiderable; and there are few compound engines, but what, upon account of the friction of the parts againſt one another,

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will require a third part of more power to work them when loaded, than what is ſufficient to conſtitute a balance between the weight and the power.

Of Mills, Cranes, Wheel-carriages, and the Engine for driving Piles.

As theſe machines are ſo univerſally uſeful, it would be ridiculous to make any apology for deſcribing them.

In a common *breaſt-mill*, where the fall of water may be about ten feet, AA (Plate CVIII. fig. 9.) is the great wheel, which is generally about 17 or 18 feet in diameter, reckoned from the outermoſt edge of any float-board at *a* to that of its oppoſite float at *b*. To this wheel the water is conveyed through a channel; and ſo, falling upon the wheel, turns it round.

On the axis BB of this wheel, and within the mill-houſe, is a wheel D, about 8 or 9 feet diameter, having 61 cogs, which turn a trundle E containing ten upright ſtaves or rounds; and when theſe are the number of cogs and rounds, the trundle will make $6\frac{1}{10}$ revolutions for one revolution of the wheel.

The trundle is fixt upon a ſtrong iron axis called the ſpindle, the lower end of which turns in a braſs foot, fixt at F, in the horizontal beam ST called the bridge-tree; and the upper part of the ſpindle turns in a wooden buſh fixt into the nether millſtone which lies upon beams in the floor YY. The top part of the ſpindle above the buſh is ſquare, and goes into a ſquare hole in a ſtrong iron croſs *abcd* (ſee fig. 3.) called the rynd; under which, and cloſe to the buſh, is a round piece of thick leather upon the ſpindle, which it turns round at the ſame time as it does the rynd.

The rynd is let into grooves in the under ſurface of the running millſtone G (fig. 2.) and ſo turns it round in the ſame time that the trundle E is turned round by the cog-wheel D. This millſtone has a large hole quite through its middle, called the eye of the ſtone, through which the middle part of the rynd and upper end of the ſpindle may be ſeen; whilſt the four ends of the rynd lie hid below the ſtone in their grooves.

The end T of the bridge-tree TS (which ſupports the upper millſtone G upon the ſpindle) is fixed into a hole in the wall; and the end S is let into a beam QR called the brayer, whoſe end R remains fixt in a mortiſe; and its other end Q hangs by a ſtrong iron rod P which goes through the floor YY, and has a ſcrew-nut on its top at O; by the turning of which nut, the end Q of the brayer is raiſed or depreſſed at pleaſure, and conſequently the bridge-tree TS and upper millſtone. By this means, the upper millſtone may be ſet as cloſe to the under one, or raiſed as high from it, as the miller pleaſes. The nearer the millſtones are to one another, the finer they grind the corn; and the more remote from one another, the coarſer.

The upper millſtone G is incloſed in a round box H, which does not touch it any where; and is about an inch diſtant from its edge all around. On the top of this box ſtands a frame for holding the hopper *kk*, to which is hung the ſhoe I by two lines faſtened to the hind-part of it, fixed upon hooks in the hopper, and by one end of the crook-ſtring K faſtened to the fore-part of it at *i*; the other end being twiſted round the pin L. As the pin is turned one way, the ſtring draws up the ſhoe cloſer to the hopper, and ſo leſſens the aperture between them; and as the pin is turned the other way, it lets down the ſhoe, and enlarges the aperture.

If the ſhoe be drawn up quite to the hopper, no corn can fall from the hopper into the mill; if it be let a little down, ſome will fall: and the quantity will be more or leſs, according as the ſhoe is more or leſs let down. For the hopper is open at bottom, and there is a hole in the bottom of the ſhoe; not directly under the bottom of the hopper, but forwarder towards the end *i*, over the middle of the eye of the millſtone.

There is a ſquare hole in the top of the ſpindle, in which is put the feeder *e* (fig. 10.) This feeder (as the ſpindle turns round) jogs the ſhoe three times in each revolution, and ſo cauſes the corn to run conſtantly down from the hopper, through the ſhoe, into the eye of the millſtone, where it falls upon the top of the rynd, and is, by the motion of the rynd and the leather under it, thrown below the upper ſtone, and ground between it and the lower one. The violent motion of the ſtone creates a centrifugal force in the corn going round with it, by which means it gets farther and farther from the centre, as in a ſpiral, in every revolution, until it be thrown quite out; and, being then ground, it falls through a ſpout M, called the mill-eye, into the trough N.

When the mill is fed too faſt, the corn bears up the ſtone, and is ground too coarſe; and beſides, it clogs the mill ſo as to make it go too ſlow. When the mill is too ſlowly fed, it goes too faſt, and the ſtones by their attrition are apt to ſtrike fire againſt one another. Both which inconveniencies are avoided by turning the pin L backwards or forwards, which draws up or lets down the ſhoe; and ſo regulates the feeding as the miller ſees convenient.

The heavier the running millſtone is, and the greater the quantity of water that falls upon the wheel, ſo much the faſter will the mill bear to be fed; and conſequently ſo much the more it will grind. And on the contrary, the lighter the ſtone, and the leſs the quantity of water, ſo much ſlower muſt the feeding be. But when the ſtone is conſiderably wore, and become light, the mill muſt be fed ſlowly at any rate; otherwiſe the ſtone will be too much borne up by the corn under it, which will make the meal coarſe.

The quantity of power required to turn a heavy millſtone is but a very little more than what is ſufficient to turn a light one: for as it is ſupported upon the ſpindle by the bridge-tree ST, and the end of the ſpindle that turns in the braſs foot therein being but ſmall, the odds ariſing from the weight is but very inconſiderable in its action againſt the power or force of the water. And beſides, a heavy ſtone has the ſame advantage as a heavy fly; namely, that it regulates the motion much better than a light one.

In order to cut and grind the corn, both the upper and under millſtones have channels or furrows cut into them, proceeding obliquely from the centre towards the circumference. And theſe furrows are each cut perpendicularly on one ſide and obliquely on the other into the ſtone, which

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Fig. 1.

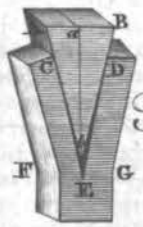


Fig. 2.

Fig. 3.

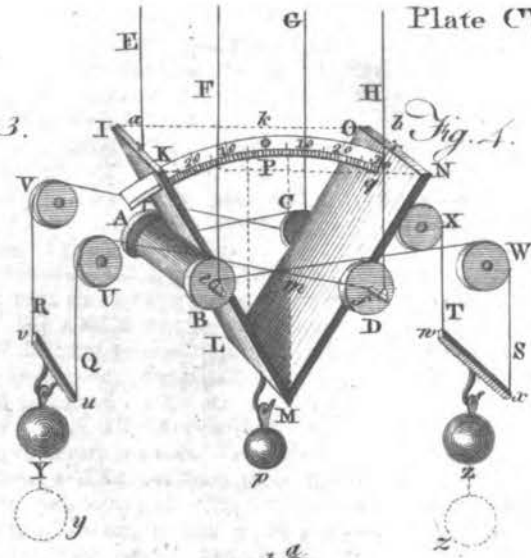


Fig. 4.

Fig. 5.

Fig. 6.

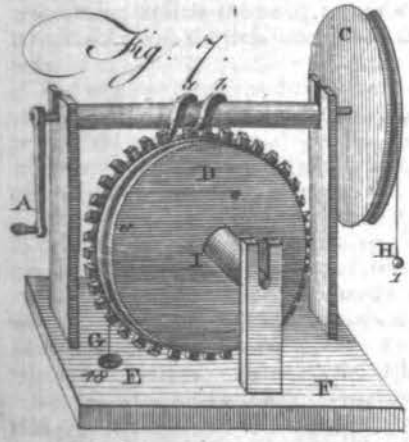


Fig. 7.

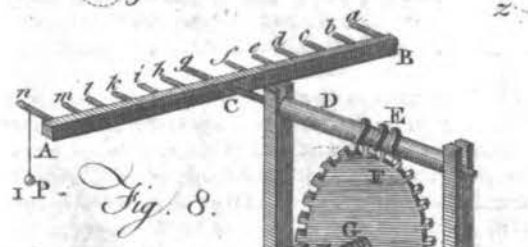


Fig. 8.

Fig. 10.

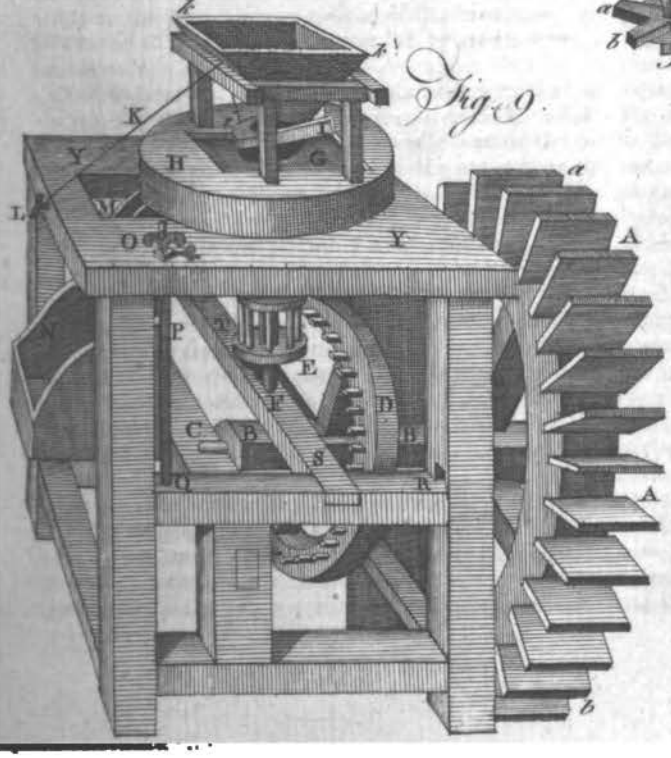
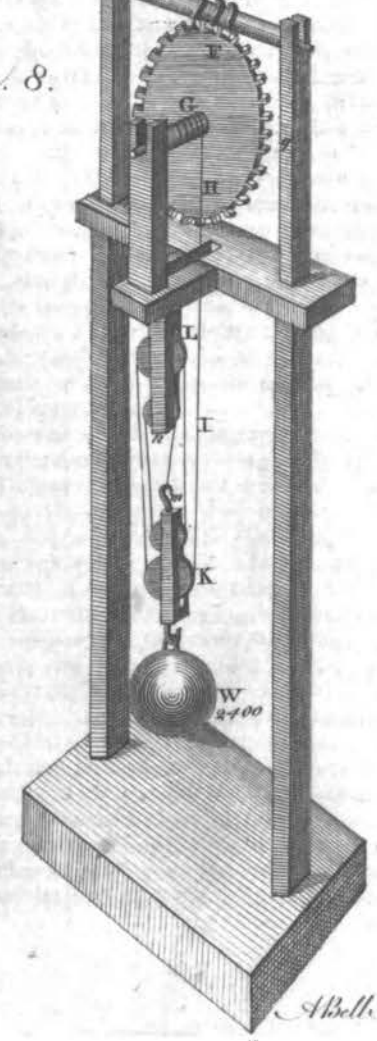


Fig. 9.



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which gives each furrow a ſharp edge, and in the two ſtones they come, as it were, againſt one another like the edges of a pair of ſciſſars: and ſo cut the corn, to make it grind the eaſier when it falls upon the places between the furrows. Theſe are cut the ſame way in both ſtones when they lie upon their backs, which makes them run croſs ways to each other when the upper ſtone is inverted by turning its furrowed ſurface towards that of the lower. For, if the furrows of both ſtones lay the ſame way, a great deal of the corn would be driven onward in the lower furrows, and ſo come out from between the ſtones without ever being cut.

When the furrows became blunt and ſhallow by wearing, the running ſtone muſt be taken up, and both ſtones new dreſt with a chiſel and hammer. And every time the ſtone is taken up, there muſt be ſome tallow put round the ſpindle upon the buſh, which will ſoon be melted by the heat that the ſpindle acquires from its turning and rubbing againſt the buſh, and ſo will get in betwixt them: otherwiſe the buſh would take fire in a very little time.

The buſh muſt embrace the ſpindle quite cloſe, to prevent any ſhake in the motion; which would make ſome parts of the ſtones grate and fire againſt each other; whilſt other parts of them would be too far aſunder, and by that means ſpoil the meal in grinding.

Whenever the ſpindle wears the buſh ſo as to begin to ſhake in it, the ſtone muſt be taken up, and a chiſel drove into ſeveral parts of the buſh; and when it is taken out, wooden wedges muſt be driven into the holes; by which means the buſh will be made to embrace the ſpindle cloſe all around it again. In doing this, great care muſt be taken to drive equal wedges into the buſh on oppoſite ſides of the ſpindle; otherwiſe it will be thrown out of the perpendicular, and ſo hinder the upper ſtone from being ſet parallel to the under one, which is abſolutely neceſſary for making good work. When any accident of this kind happens, the perpendicular poſition of the ſpindle muſt be reſtored by adjuſting the bridge-tree ST by proper wedges put between it and the brayer QR.

It often happens, that the rynd is a little wrenched in laying down the upper ſtone upon it; or is made to ſink a little lower upon one ſide of the ſpindle than on the other; and this will cauſe one edge of the upper ſtone to drag all around upon the other, whilſt the oppoſite edge will not touch. But this is eaſily ſet to rights, by raiſing the ſtone a little with a lever, and putting bits of paper, cards, or thin chips, betwixt the rynd and the ſtone.

The diameter of the upper ſtone is generally about ſix feet, the lower ſtone about an inch more: and the upper ſtone when new contains about $22\frac{1}{2}$ cubic feet, which weighs ſomewhat more than 1900 pounds. A ſtone of this diameter ought never to go more than 60 times round in a minute; for if it turns faſter, it will heat the meal.

The grinding ſurface of the under ſtone is a little convex from the edge to the centre, and that of the upper ſtone a little more concave: ſo that they are fartheſt from one another in the middle, and come gradually nearer towards the edges. By this means, the corn at its firſt entrance between the ſtones is only bruiſed; but as it goes farther on towards the circumference or edge, it is cut ſmaller and ſmaller; and at laſt finely ground juſt before it comes out from between them.

The water-wheel muſt not be too large, for if it be, its motion will be too ſlow; nor too little, for then it will want power. And for a mill to be in perfection, the floats of the wheel ought to move with a third part of the velocity of the water, and the ſtone to turn round once in a ſecond of time.

Such a mill as this, with a fall of water about $7\frac{1}{2}$ feet, will require about 32 hogſheads every minute to turn the wheel with a third part of the velocity with which the water falls, and to overcome the reſiſtance ariſing from the friction of the geers and attrition of the ſtones in grinding the corn.

The greater fall the water has, the leſs quantity of it will ſerve to turn the mill. The water is kept up in the mill-dam, and let out by a ſluice called the penſtock, when the mill is to go. When the penſtock is drawn up by means of a lever, it opens a paſſage through which the water flows to the wheel; and when the mill is to be ſtopt, the penſtock is let down, which ſtops the water from falling upon the wheel.

A leſs quantity of water will turn an overſhot-mill (where the wheel has buckets inſtead of float-boards) than a breaſt-mill where the fall of the water ſeldom exceeds half the height *Ab* of the wheel. So that, where there is but a ſmall quantity of water, and a fall great enough for the wheel to lie under it, the bucket (or overſhot) wheel is always uſed. But where there is a large body of water, with a little fall, the breaſt or float-board wheel muſt take place. Where the water runs only upon a little declivity, it can act but ſlowly upon the under part of the wheel at *b*; in which caſe the motion of the wheel will be very ſlow: and therefore, the floats ought to be very long, though not high, that a large body of water may act upon them; ſo that what is wanting in velocity may be made up in power; and then the cog-wheel may have a greater number of cogs in proportion to the rounds in the trundle, in order to give the millſtone a ſufficient degree of velocity.

They who have read what is ſaid in the firſt ſection, concerning the acceleration of bodies falling freely by the power of gravity acting conſtantly and uniformly upon them, may perhaps aſk, Why ſhould the motion of the wheel be equable, and not accelerated, ſince the water acts conſtantly and uniformly upon it? The plain anſwer is, That the velocity of the wheel can never be ſo great as the velocity of the water that turns it; for, if it ſhould become ſo great, the power of the water would be quite loſt upon the wheel, and then there would be no proper force to overcome the friction of the geers and attrition of the ſtones. Therefore, the velocity with which the wheel begins to move, will increaſe no longer than till its *momentum* or force is balanced by the reſiſtance of the machine; and then the wheel will go on with an equable motion.

[If the cog-wheel D be made about 18 inches diameter, with 30 cogs, the trundle as ſmall in proportion with 10 ſtaves, and the milſtones be each about two feet in diameter, and the whole work be put into a ſtrong frame of wood,

as

as repreſented in the figure, the engine will be a hand-mill for grinding corn or malt in private families. And then, it may be turned by a winch, inſtead of the wheel AA; the millſtone making three revolutions for every one of the winch. If a heavy fly be put upon the axle B, near the winch, it will help to regulate the motion.]

If the cogs of the wheel and rounds of the trundle could be put in as exactly as the teeth are cut in the wheels and pinions of a clock, then the trundle might divide the wheel exactly; that is to ſay, the trundle might make a given number of revolutions for one of the wheel, without a fraction. But as any exact number is not neceſſary in mill-work, and the cogs and rounds cannot be ſet in ſo truly as to make all the intervals between them equal; a ſkilful mill-wright will always give the wheel what he calls *a hunting cog*; that is, one more than what will anſwer to an exact diviſion of the wheel by the trundle. And then, as every cog comes to the trundle, it will take the next ſtaff or round behind the one which it took in the former revolution: and by that means, will wear all the parts of the cogs and rounds which work upon one another equally, and to equal diſtances from one another in a little time; and ſo make a true uniform motion throughout the whole work. Thus, in the above water-mill, the trundle has 10 ſtaves, and the wheel 61 cogs.

Sometimes, where there is a ſufficient quantity of water, the cog-wheel AA (Plate CIX. fig. 1.) turns a large trundle BB, on whoſe axis C is fixed the horizontal wheel D, with cogs all round its edge, turning two trundles E and F at the ſame time; whoſe axes or ſpindles G and H turn two millſtones I and K, upon the fixed ſtones L and M. And when there is not work for them both, either may be made to lie quiet, by taking out one of the ſtaves of its trundle, and turning the vacant place towards the cog-wheel D. And there may be a wheel fixt on the upper end of the great upright axle C for turning a couple of boulting-mills, and other work for drawing up the ſacks, fanning and cleaning the corn, ſharpening of tools, &c.

If, inſtead of the cog-wheel AA and trundle BB, horizontal levers be fixed into the axle C, below the wheel D; then, horſes may be put to theſe levers for turning the mill; which is often done where water cannot be had for that purpoſe.

The working parts of a wind-mill differ very little from thoſe of a water mill; only the former is turned by the action of the wind upon four ſails, every one of which ought (as is generally believed) to make an angle of $54\frac{3}{4}$ degrees with a plane perpendicular to the axis on which the arms are fixt for carrying them; it being demonſtrable, that when the ſails are ſet to ſuch an angle, and the axis turned end-ways toward the wind, the wind has the greateſt power upon the ſails. But this angle anſwers only to the caſe of a vane or ſail juſt beginning to move: for, when the vane has a certain degree of motion, it yields to the wind; and then that angle muſt be increaſed to give the wind its full effect.

Again, the increaſe of this angle ſhould be different, according to the different velocities from the axis to the extremity of the vane. At the axis it ſhould be $54\frac{3}{4}$ degrees, and thence continually increaſe, giving the vane a twiſt, and ſo cauſing all the ribs of the vane to lie in different planes.

Laſtly, theſe ribs ought to decreaſe in length from the axis to the extremity, giving the vane a curvilineal form; ſo that no part of the force of any one rib be ſpent upon the reſt, but all move on independent of each other. All this is required to give the ſails of a wind-mill their true form: and we ſee both the twiſt and the diminution of the ribs exemplified in the wings of birds.

It is almoſt incredible to think with what velocity the tips of the ſails move when acted upon by a moderate gale of wind. We have ſeveral times counted the number of revolutions made by the ſails in ten or fifteen minutes; and from the length of the arms from tip to tip, have computed, that if a hoop of that diameter was to run upon the ground with the ſame velocity that it would move if put upon the ſail-arms, it would go upwards of 30 miles in an hour.

As the ends of the ſails neareſt the axis cannot move with the ſame velocity that the tips or fartheſt ends do, although the winds act equally ſtrong upon them; perhaps a better poſition than that of ſtretching them along the arms directly from the centre of motion, might be to have them ſet perpendicularly acroſs the farther ends of the arms, and there adjuſted lengthwiſe to the proper angle. For, in that caſe, both ends of the ſails would move with the ſame velocity; and being farther from the centre of motion, they would have ſo much the more power: and then, there would be no occaſion for having them ſo large as they are generally made, which would render them lighter, and conſequently there would be ſo much the leſs friction on the thick neck of the axle where it turns in the wall.

A *crane* is an engine by which great weights are raiſed to certain heights, or let down to certain depths. It conſiſts of wheels, axles, pulleys, ropes, and a gib or gibbet. When the rope H (fig. 2.) is hooked to the weight K, a man turns the winch A, on the axis whereof is the trundle B, which turns the wheel C, on whoſe axis D is the trundle E, which turns the wheel F with its upright axis G, on which the great rope HH winds as the wheel turns; and going over a pulley I at the end of the arm *d* of the gib *ccde*, it draws up the heavy burden K, which being raiſed to a proper height, as from a ſhip to the quay, is then brought over the quay by pulling the wheel Z round by the handles *z*,*z*, which turns the gib by means of the half wheel *b* fixt on the gib-poſt *cc*, and the ſtrong pinion *a* fixt on the axis of the wheel Z. This wheel gives the man that turns it an abſolute command over the gib, ſo as to prevent it from taking any unlucky ſwing, ſuch as often happens when it is only guided by a rope tied to its arm *d*; and people are frequently hurt, ſometimes killed, by ſuch accidents.

The great rope goes between two upright upright rollers *i* and *k*, which turn upon gudgeons in the fixed beams *f* and *g*: and as the gib is turned towards either ſide, the rope bends upon the roller next that ſide. Were it not for theſe rollers, the gib would be quite unmanageable; for the moment it were turned ever ſo little towards any ſide, the weight K would begin to deſcend, becauſe the rope would be ſhortened between the pulley

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I and axis G; and ſo the gib would be pulled violently to that ſide, and either be broken to pieces, or break every thing that came in its way. Theſe rollers muſt be placed ſo, that the ſides of them, round which the rope bends, may keep the middle of the bended part directly even with the centre of the hole in which the upper gudgeon of the gib turns in the beam *f*. The truer theſe rollers are placed, the eaſier the gib is managed, and the leſs apt to ſwing either way by the force of the weight K.

A ratchet-wheel Q is fixt upon the axis D, near the trundle E; and unto this wheel falls the catch or click R. This hinders the machine from running back by the weight of the burden K, if the man who raiſes it ſhould happen to be careleſs, and ſo leave off working at the winch A ſooner than he ought to do.

When the burden K is raiſed to its proper height from the ſhip, and brought over the quay by turning the gib about, it is let down gently upon the quay, or into a cart ſtanding thereon, in the following manner: A man takes hold of the rope *tt* (which goes over the pulley *v*, and is tied to a hook at S in the catch R) and ſo diſengages the catch from the ratchet wheel Q; and then, the man at the winch A turns it backward, and lets down the weight K. But if the weight pulls too hard againſt this man, another lays hold of the handle V, and by pulling it downward, draws the gripe U cloſe to the wheel Y, which, by rubbing hard againſt the gripe, hinders the too quick deſcent of the weight; and not only ſo, but even ſtops it at any time, if required. By this means, heavy goods may be either raiſed or let down at pleaſure, without any danger of hurting the men who work the engine.

When part of the goods are craned up, and the rope is to be let down for more, the catch R is firſt diſengaged from the ratchet-wheel Q, by pulling the cord *t*; then the handle *q* is turned half round backward, which, by the crank *nn* in the piece *o*, pulls down the frame *b* between the guides *m* and *m* (in which it ſlides in a groove) and ſo diſengages the trundle B from the wheel C: and then, the heavy hook β at the end of the rope H deſcends by its own weight, and turns back the great wheel F with its trundle E, and the wheel C; and this laſt wheel acts like a fly againſt the wheel E and hook β, and ſo hinders it from going down too quick; whilſt the weight X keeps up the gripe U from rubbing againſt the wheel Y, by means of a cord going from the weight, over the pulley *w* to the hook W in the gripe; ſo that the gripe never touches the wheel, unleſs it be pulled down by the handle V.

When the crane is to be ſet at work again, for drawing up another burden, the handle *q* is turned half round forewards: which, by the crank *nn*, raiſes up the frame *b*, and cauſes the trundle B to lay hold of the wheel C; and then, by turning the winch A, the burden of goods K is drawn up as before.

The crank *nn* turns pretty ſtiff in the mortiſe near *o*, and ſtops againſt the farther end of it when it has got juſt a little beyond the perpendicular; ſo that it can never come back of itſelf: and therefore the trundle B can never come away from the wheel C, until the handle *q* be turned half round.

The great rope runs upon rollers in the lever LM, which keep it from bending between the axle at G and the pulley I. This lever turns upon the axis N by means of the weight O, which is juſt ſufficient to keep its end L up to the rope; ſo that, as the great axle turns, and the rope coils round it, the lever riſes with the rope, and prevents the coilings from going over one another.

The power of this crane may be eſtimated thus: Suppoſe the trundle B to have 13 ſtaves or rounds, and the wheel C to have 78 ſpur cogs; the trundle E to have 14 ſtaves, and the wheel F 56 cogs: then, by multiplying the ſtaves of the trundles, 13 and 14, into one another, their product will be 182; and by multiplying the cogs of the wheels, 78 and 56, into one another, their product will be 4368; and dividing 4368 by 182, the quotient will be 24; which ſhews that the winch A makes 24 turns for one turn of the wheel F and its axle G on which the great rope or chain HIH winds. So that, if the length or radius of the winch A were only equal to half the diameter of the great axle G, added to half the thickneſs of the rope H, the power of the crane would be as 24 to 1: but the radius of the winch being double the above length, it doubles the ſaid power, and ſo makes it as 48 to 1: in which caſe a man may raiſe 48 times as much weight by this engine as he could do by his natural ſtrength without it; making proper allowance for the friction of the working parts. Two men may work at once, by having another winch on the oppoſite end of the axis of the trundle under B; and ſo make the power ſtill double.

If this power be thought greater than what may be generally wanted, the wheels may be made with fewer cogs in proportion to the ſtaves in the trundles: and ſo the power may be of whatever degree is judged to be requiſite. But if the weight be ſo great as will require yet more power to raiſe it (ſuppoſe a double quantity) then the rope H may be put under a moveable pulley, as *d*, and the end of it tied to a hook in the gib at *e*; which will give a double power to the machine, and ſo raiſe a double weight hooked to the block of the moveable pulley.

When only ſmall burdens are to be raiſed, this may be quickly done by men puſhing the axle G round by the hand-ſpokes *y,y y,y*; having firſt diſengaged the trundle B from the wheel C: and then, this wheel will only act as a fly upon the wheel F; and the catch R will prevent its running back, if the men ſhould inadvertently leave off puſhing before the burden be unhooked from β.

Laſtly, when very heavy burdens are to be raiſed, which might endanger the breaking of the cogs in the wheel F; their force againſt theſe cogs may be much abated by men puſhing round the hand-ſpokes *y,y,y,y*, whilſt the man at A turns the winch.

We have only ſhewn the working parts of this crane, without the whole of the beams which ſupport them; knowing that theſe are eaſily ſuppoſed, and that if they had been drawn, they would have hid a great deal of the working parts from ſight, and alſo confuſed the figure.

Another very good *crane* is made in the following manner. AA (fig. 3.) is a great wheel turned by men walking within it at H. On the part C, of its axle BC, the great rope D is wound as the wheel turns; and this

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rope draws up goods in the ſame way as the rope HH does in the above-mentioned crane, the gib-work here being ſuppoſed to be of the ſame ſort. But theſe cranes are very dangerous to the men in the wheel; for, if any of the men ſhould chance to fall, the burden will make the wheel run back and throw them all about within it; which often breaks their limbs, and ſometimes kills them. The late ingenious Mr *Padmore* of Briſtol, whoſe contrivance the forementioned crane is, obſerving this dangerous conſtruction, contrived a method for remedying it, by putting cogs all around the outſide of the wheel, and applying a trundle E to turn it; which increaſes the power as much as the number of cogs in the wheel is greater than the number of ſtaves in the trundle: and by putting a ratchet-wheel F on the axis of the trundle, (as in the above-mentioned crane, with a catch to fall into it, the great wheel is ſtopt from running back by the force of the weight, even if all the men in it ſhould leave off walking. And by one man working at the winch I, or two men at the oppoſite winches when needful, the men in the wheel are much aſſiſted, and much greater weights are raiſed, than could be by men only within the wheel. Mr. *Padmore* put alſo a gripe-wheel G upon the axis of the trundle, which being pinched in the ſame manner as deſcribed in the former crane, heavy burdens may be let down without the leaſt danger. And before this contrivance, the lowering of goods was always attended with the utmoſt danger to the men in the wheel; as every one muſt be ſenſible of, who has ſeen ſuch engines at work.

And it is ſurpriſing that the maſters of wharfs and cranes ſhould be ſo regardleſs of the limbs, or even lives of their workmen, that, excepting the late Sir *James Creed* of Greenwich, and ſome gentlemen at Briſtol, there is ſcarce an inſtance of any who has uſed this ſafe contrivance.

THE ſtructure of wheel-carriages is generally ſo well known, that it would be needleſs to deſcribe them. And therefore, we ſhall only point out ſome inconveniencies attending the common method of placing the wheels, and loading the waggons.

In coaches, and all other four-wheeled carriages, the fore-wheels are made of a leſs ſize than the hind ones, both on account of turning ſhort, and to avoid cutting the braces: otherwiſe, the carriage would go much eaſier if the fore-wheels were as high as the hind ones; and the higher the better, becauſe their motion would be ſo much the ſlower on their axles, and conſequently the friction proportionably taken off. But carriers and coachmen give another reaſon for making the fore-wheels much lower than the hind-wheels; namely, that when they are ſo, the hind-wheels help to puſh on the fore ones: which is too unphiloſophical and abſurd to deſerve a refutation; and yet for their ſatisfaction, we ſhall ſhew by experiment that it has no exiſtence but in their own imaginations.

It is plain, that the ſmall wheels muſt turn as much oftener round than the great ones, as their circumferences are leſs. And therefore, when the carriage is loaded equally heavy on both axles, the fore-axle muſt endure as much more friction, and conſequently wear out as much ſooner, than the hind-axle, as the fore-wheels are leſs than the hind ones. But the great misfortune is, that all the carriers to a man do obſtinately perſiſt, againſt the cleareſt reaſon and demonſtration, in putting the heavier part of the load upon the fore-axle of the waggon; which not only makes the friction greateſt where it ought to be leaſt, but alſo preſſeth the fore-wheels deeper into the ground than the hind wheels, notwithſtanding the fore-wheels, being leſs than the hind ones, are with ſo much the greater difficulty drawn out of a hole or over an obſtacle, even ſuppoſing the weights on their axles were equal. For the difficulty, with equal weights, will be as the depth of the hole or height of the obſtacle is to the ſemidiameter of the wheel. Thus, if we ſuppoſe the ſmall wheel D (fig. 4.) of the waggon AB to fall into a hole of the depth EF, which is equal to the ſemidiameter of the wheel, and the waggon to be drawn horizontally along; it is evident, that the point E of the ſmall wheel will be drawn directly againſt the top of the hole; and therefore, all the power of horſes and men will not be able to draw it out, unleſs the ground gives way before it. Whereas, if the hind wheel C falls into ſuch a hole, it ſinks not near ſo deep in proportion to its ſemidiameter; and therefore, the point G of the large wheel will not be drawn directly, but obliquely, againſt the top of the hole; and ſo will be eaſily got out of it. Add to this, that ſince a ſmall wheel will often ſink to the bottom of a hole, in which a great wheel will go but a very little way, the ſmall wheels ought in all reaſon to be loaded with leſs weight than the great ones; and then the heavier part of the load would be leſs jolted upward and downward, and the horſes tired ſo much the leſs as their draught raiſed the load to leſs heights.

It is true, that when the waggon road is much up hill, there may be danger in loading the hind part much heavier than the fore part; for then the weight would overhang the hind axle, eſpecially if the load be high, and endanger tilting up the fore-wheels from the ground. In this caſe, the ſafeſt way would be to load it equally heavy on both axles; and then, as much more of the weight would be thrown upon the hind-axle than upon the fore one, as the ground riſes from a level below the carriage. But as this ſeldom happens, and when it does, a ſmall temporary weight laid upon the pole between the horſes would overbalance the danger; and this weight might be thrown into the waggon when it comes to level ground; it is ſtrange that an advantage ſo plain and ſo obvious as would ariſe from loading the hind-wheels heavieſt, ſhould not be laid hold of, by complying with this method.

To confirm theſe reaſonings by experiment, let a ſmall model of a waggon be made, with its fore-wheels $2\frac{1}{2}$ inches in diameter, and its hind-wheels $4\frac{1}{2}$; the whole model weighing about 20 ounces. Let this little carriage be loaded any how with weights, and have a ſmall cord tied to each of its ends, equally high from the ground it reſts upon; and let it be drawn along a horizontal board, firſt by a weight in a ſcale hung to the cord at the fore part; the cord going over a pulley at the end of the board to facilitate the draught, and the weight juſt ſufficient to draw it along. Then, turn the carriage, and hang the ſcale and weight to the hind cord, and it will be

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be found to move along with the ſame velocity as at firſt: which ſhews, that the power required to draw the carriage is all the ſame, whether the great or ſmall wheels are foremoſt; and therefore the great wheels do not help in the leaſt to puſh on the ſmall wheels in the road.

Hang the ſcale to the fore cord, and place the fore-wheels (which are the ſmall ones) in two holes, cut three eighth-parts of an inch deep into the board; then put a weight of 32 ounces into the carriage, over the fore-axle, and an equal weight over the hind one: this done, put 44 ounces into the ſcale, which will be juſt ſufficient to draw out the fore-wheels: but if this weight be taken out of the ſcale, and one of 16 ounces put into its place, if the hind-wheels are placed in the holes, the 16 ounces weight will draw them out; which is little more than a third part of what was neceſſary to draw out the fore-wheels. This ſhews, that the larger the wheels are, the leſs power will draw the carriage, eſpecially on rough ground.

Put 64 ounces over the axle of the hind-wheels, and 32 over the axle of the fore ones, in the carriage; and place the fore-wheels in the holes: then, put 38 ounces into the ſcale, which will juſt draw out the fore-wheels; and when the hind ones come to the hole, they will find but very little reſiſtance, becauſe they ſink but a little way into it.

But ſhift the weights in the carriage, by putting the 32 ounces upon the hind axle, and the 64 ounces upon the fore one; and place the fore-wheels in the holes; then, if 76 ounces be put into the ſcale, it will be found no more than ſufficient to draw out theſe wheels; which is double the power required to draw them out, when the lighter part of the load was put upon them: which is a plain demonſtration of the abſurdity of putting the heavieſt part of the load in the fore part of the waggon.

Every one knows what an outcry was made by the generality, if not the whole body, of the carriers, againſt the broad-wheel act; and how hard it was to perſuade them to comply with it, even though the government allowed them to draw with more horſes, and carry greater loads, than uſual. Their principal objection was, that as a broad wheel muſt touch the ground in a great many more points than a narrow wheel, the friction muſt of courſe be juſt ſo much the greater; and conſequently, there muſt be ſo many more horſes than uſual, to draw the waggon. It is believed that the majority of people were of the ſame opinion, not conſidering, that if the whole weight of the waggon and load in it bears upon a great many points, each ſuſtains a proportionably leſs degree of weight and friction, than when it bears only upon a few points; ſo that what is wanting in one, is made up in the other; and therefore will be juſt equal under equal degrees of weight, as may be ſhewn by the following plain and eaſy experiment.

Let one end of a piece of packthread be faſtened to a brick, and the other end to a common ſcale for holding weights: then, having laid the brick edgewiſe on a table, and let the ſcale hang under the edge of the table, put as much weight into the ſcale as will juſt draw the brick along the table. Then taking back the brick to its former place, lay it flat on the table, and leave it to be acted upon by the ſame weight in the ſcale as before, which will draw it along with the ſame eaſe as when it lay upon its edge. In the former caſe, the brick may be conſidered as a narrow wheel on the ground; and in the latter, as a broad wheel. And ſince the brick is drawn along with equal eaſe, whether its broad ſide or narrow edge touches the table, it ſhews that a broad wheel might be drawn along the ground with the ſame eaſe as a narrow one (ſuppoſing them equally heavy) even though they ſhould drag, and not roll, as they go along.

As narrow wheels are always ſinking into the ground, eſpecially when the heavieſt part of the load lies upon them, they muſt be conſidered as going conſtantly up hill, even on level ground; and their edges muſt ſuſtain a great deal of friction by rubbing againſt the ſides of the ruts made by them. But both theſe inconveniencies are avoided by broad wheels; which, inſtead of cutting and ploughing up the roads, roll them ſmooth, and harden them; as experience teſtifies in places where they have been uſed, eſpecially either on wettiſh or ſandy ground: though after all it muſt be confeſſed, that they will not do in ſtiff clayey croſs-roads; becauſe they would ſoon gather up as much clay as would be almoſt equal to the weight of an ordinary load.

If the wheels were always to go upon ſmooth and level ground, the beſt way would be to make the ſpokes perpendicular to the naves; that is, to ſtand at right angles to the axles; becauſe they would then bear the weight of the load perpendicularly, which is the ſtrongeſt way for wood. But becauſe the ground is generally uneven, one wheel often falls into a cavity or rut when the other does not; and then it bears much more of the weight than the other does: in which caſe, concave or diſhing wheels are beſt; becauſe when one falls into a rut, and the other keeps upon high ground, the ſpokes become perpendicular in the rut, and therefore have the greateſt ſtrength when the obliquity of the load throws moſt of its weight upon them; whilſt thoſe on the high ground have leſs weight to bear, and therefore need not be at their full ſtrength. So that the uſual way of making the wheels concave is by much the beſt.

The axles of the wheels ought to be perfectly ſtraight, that the rims of the wheels may be parallel to each other; for then they will move eaſieſt, becauſe they will be at liberty to go on ſtraight forewards. But in the uſual way of practice, the axles are bent downward at their ends; which brings the ſides of the wheels next the ground nearer to one another than their oppoſite or higher ſides are: and this not only makes the wheels to drag ſidewiſe as they go along, and gives the load a much greater power of cruſhing them than when they are parallel to each other, but alſo endangers the overturning of the carriage when any wheel falls into a hole or rut; or when the carriage goes in a road which has one ſide lower than the other, as along the ſide of a hill. Thus (in the hind view of a waggon or cart) let AE and BF (fig. 5.) be the great wheels parallel to each other, on their ſtraight axle K, and HCI the carriage loaded with heavy goods from C to G. Then, as the carriage goes on in the oblique road AaB, the centre of gravity of the whole machine and load will be at C (ſee p. 35. col. 1.) and the line-

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line of direction C*d*D falling within the wheel BF, the carriage will not overſet. But if the wheels be inclined to each other at the ground, as AE and BF (fig. 6.) are, and the machine be loaded as before, from C to G, the line of direction C*d*D falls without the wheel BF, and the whole machine tumbles over. When it is loaded with heavy goods (ſuch as lead or iron) which lie low, it may travel ſafely upon an oblique road ſo long as the centre of gravity is at C, and the line of direction C*d* (fig. 5.) falls within the wheels; but if it be loaded high with lighter goods (ſuch as woolpacks) from C to L, (fig. 7.) the centre of gravity is raiſed from C to K, which throws the line of direction K*k* without the loweſt edge of the wheel BF, and then the load overſets the waggon.

If there be ſome advantage from ſmall fore-wheels, on account of the carriage turning more eaſily and ſhort than it can be made to do when they are large; there is at leaſt as great a diſadvantage attending them, which is, that as their axle is below the level of the horſes breaſts, the horſes not only have the loaded carriage to draw along, but alſo part of its weight to bear; which tires them ſooner, and makes them grow much ſtiffer in their hams, than they would be if they drew on a level with the fore axle: and for this reaſon, we find coach-horſes ſoon become unfit for riding. So that on all accounts it is plain, that the fore-wheels of all carriages ought to be ſo high, as to have their axles even with the breaſts of the horſes; which would not only give the horſes a fair draught, but likewiſe cauſe the machine to be drawn by a leſs degree of power.

MECHLIN, a large well built and fortified city of Brabant, twelve miles north eaſt of Bruſſels.

MECHOACAN, a province of Mexico, bounded by Panuco, on the north; by Mexico Proper, on the eaſt; by the Pacific ocean, on the ſouth; and by Guadalajara, or New Galicia, on the weſt.

MECKLENBURG DUCHY, a province of Germany, in the province of Lower Saxony, about 100 miles long, and 60 broad; bounded by the Baltic ſea, on the north; by Pomerania, on the eaſt; by Brandenburg, on the ſouth; and by the duchies of Holſtein, Lunenburg, and Lawenburg, on the weſt.

MECON, a great river, which riſes in the north of further India, and, running ſouth through the kingdows of Laos and Cambodia, falls into the Indian ocean.

MECONIUM, in medicine, a black thick fæces gathered in the inteſtines of infants, and brought with them into the world at the time of their birth.

MECONIUM, in pharmacy, the extract of Engliſh poppies.

Meconium has all the virtues of the foreign opium, but in a ſomewhat lower degree. See OPIUM.

MEDAL, a piece of metal in the form of coin, intending to convey to poſterity the portrait of ſome great perſon, or the memory of ſome illuſtrious action.

The parts of a medal are the two ſides, one of which is called the face or head, and the other the reverſe. On each ſide is the area, or field, which makes the middle of the medal; the rim, or border; and the exergum: and one the two ſides are diſtinguiſhed the type or the figure repreſented, and the legend or inſcription.

As to the antiquity of medals, the Greek are certainly the moſt ancient; for long before the building of Rome the Greeks had beautiful money in gold, ſilver, and copper. This plainly appears from ſeveral genuine medals of Macedon, older than Philip and Alexander; from Greek medals with the names of ſeveral magiſtrates prior to the Macedonian empire; to which we may add ſome Sicilian coins of ſtill greater antiquity. As the Greek medals are the moſt ancient, ſo are they the moſt beautiful; they have a deſign, accuracy, force, and delicacy, that expreſſes even the muſcles and veins, and are ſtruck with ſuch exquiſite art, as the Romans could never come up to. Thoſe ſtruck when Rome was governed by conſuls, are the moſt ancient among the Romans: but the copper and ſilver medals do not go beyond the 484th year of Rome, nor the gold beyond the year 546. Among the imperial medals, we diſtinguiſh between the upper and lower empire: the firſt commenced under Julius Cæſar, and ended A. D. about 260; the lower empire includes near 1200 years, and ends at the taking of Conſtantinople. It is the cuſtom, however, to account all the imperial medals till the time of the Paleologi, among the antique; though we have none of any conſiderable beauty later than the time of Heraclius, who died in 641. The Gothic medals make part of the imperial ones. Modern medals are thoſe ſtruck within theſe 300 years. There are no true Hebrew medals, except a few ſhekels of copper and ſilver, but none of gold; though there is mention made of one in the king of Denmark's cabinet.

There was formerly no difference between money and medals. An old Roman had his purſe full of the ſame pieces that we now preſerve in cabinets. As ſoon as an emperor had done any thing remarkable, as gaining a victory, giving up a tax, or the like, it was immediately ſtamped on a coin, and became current thro' his whole dominions. This was a pretty device to ſpread abroad the virtues of an emperor, and make his actions circulate; and thus a freſh coin was a kind of gazette, that publiſhed the lateſt news of the empire.

Several of our modern coins have the legend round the edges: but the ancients were too wiſe to regiſter their exploits on ſo nice a ſurface. As to the figures upon medals, the Romans always appear in the proper dreſs of their country, ſo that we may obſerve the little variations of the mode in the drapery of the medal: they would have thought it ridiculous to have drawn an emperor of Rome in a Grecian cloak or a Phyrgian mitre. On the contrary, we often ſee a king of England or France dreſſed up like a Julius Cæſar, as if they had a mind to paſs themſelves upon poſterity for Roman

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Plate CIX.

Fig. 1.

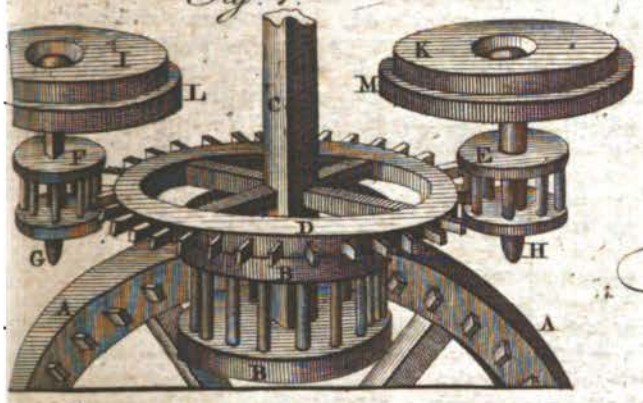


Fig. 3.

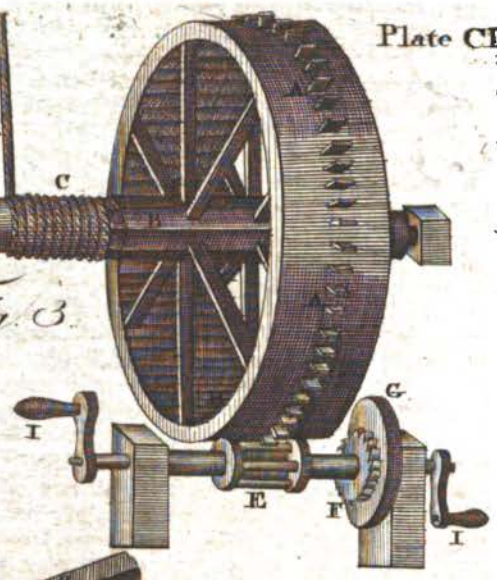


Fig. 2.

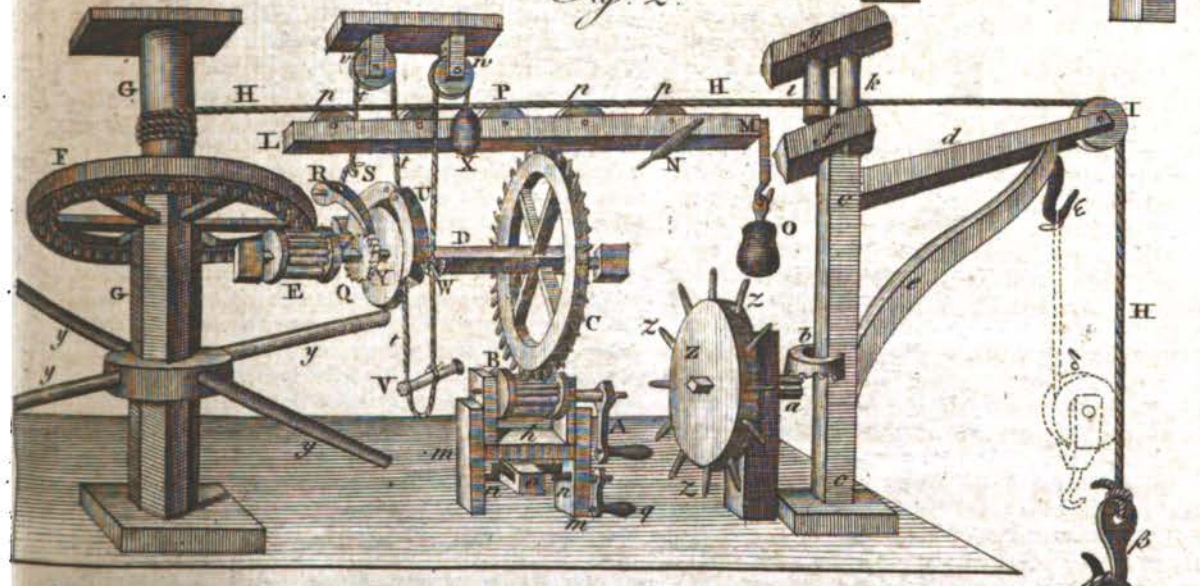


Fig. 4.

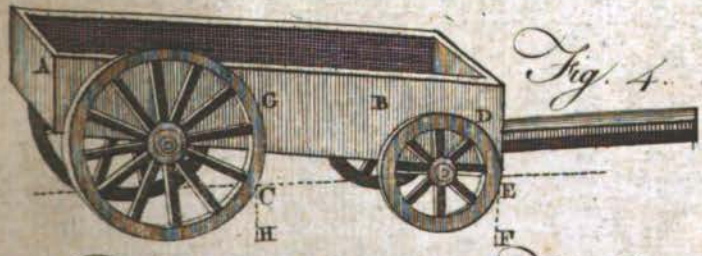


Fig. 5.

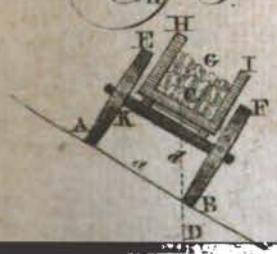


Fig. 6.

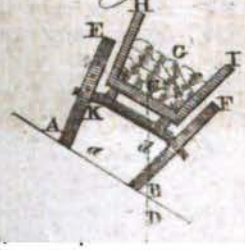
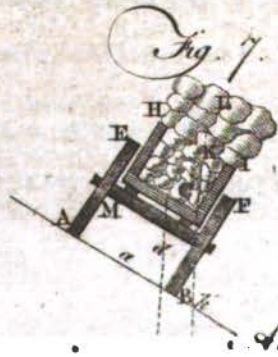


Fig. 7.



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Roman emperors. Nothing is more uſual than to ſee alluſions to Roman cuſtoms and ceremonies on the medals of our own nation; nay, they very often carry the figure of an heathen god. If poſterity take its notions of us from our medals, they muſt fancy that one of our kings paid a great devotion to Minerva, another to Apollo, *&c.* or, at leaſt, that our whole religion was a mixture of paganiſm and Chriſtianity. Had the old Romans been guilty of the ſame extravagance, there would have been ſo great a confuſion in their antiquities, that their coins would not have had half the uſe we now find in them.

The uſe of medals is very conſiderable: they give a very great light into hiſtory, in confirming ſuch paſſages as are true in old authors, in reconciling ſuch as are told in different manners, and in recording ſuch as have been omitted. In this caſe a cabinet of medals is a body of hiſtory. It was, indeed, the beſt way in the world to perpetuate the memory of great actions, thus to coin out the life of an emperor, and to put every exploit into the mint. It was a kind of printing before the art was invented: and they have this advantage over books, that they tell their ſtory quicker, and ſum up a whole volume in twenty or thirty reverſes: thus Mr Vaillant, out of a ſmall collection of medals, has given us a chronicle of the kings of Syria. They are indeed the beſt epitomes in the world, and let us ſee, with one caſt of the eye, the ſubſtance of above an hundred pages. Another uſe of medals is, that they not only ſhew the actions of an emperor, but at the ſame time mark out the year in which they were performed; for as every exploit has its date ſet to it, a ſeries of an emperor's coins is his whole life digeſted into annals. A medalliſt, upon the firſt naming of an emperor, will immediately tell his age, family, and life. To remember where he enters in the ſucceſſion, he only conſiders in what part of the cabinet he lies; and by running over in his thoughts ſuch a particular drawer, will give an account of all the remarkable parts of his reign. Nor are medals of leſs uſe in architecture, painting, poetry, *&c.* A cabinet of medals is a collection of pictures in miniature, and by them the plans of many of the moſt conſiderable buildings of antiquity are preſerved.

Impreſſions of MEDALS. A very eaſy and elegant way of taking the impreſſions of medals and coins, not generally known, is thus directed by Dr Shaw: Melt a little iſinglaſs-glue made with brandy, and pour it thinly over the medals, ſo as to cover its whole ſurface: let it remain on for a day or two, till it is thoroughly dry and hardened; and then taking it off, it will be fine, clear, and hard, as a piece of Muſcovy-glaſs, and will have a very elegant impreſſion of the coin.

Another eaſy method is as follows: Take a perfect and ſharp impreſſion, in the fineſt black ſealing-wax, of the coin or medal you deſire. Cut away the wax round the edges of the impreſſion: then with a preparation of gum-water, of the colour you would have the picture, ſpread the paint upon the wax-impreſſion with a ſmall hair pencil, obſerving to work it into all the ſinking or hollow places, theſe being the riſing parts of the medal; and the colour muſt be carefully taken from the other parts with a wet finger. Then take a piece of very thin poſt-paper, a little larger than the medal, and moiſten it quite through. Place it on the wax impreſſion; and on the back of the paper lay three or four pieces of thick woolen cloth or flannel, of about the ſame ſize. The impreſſion, with its coverings, ſhould be placed between two ſmooth iron plates, about two inches ſquare, and one tenth of an inch thick. Theſe muſt be carefully put into a ſmall preſs, made of two plates of iron, about five inches and a half long, one inch and a half wide, and half an inch in thickneſs, having a couple of long male-ſcrews running through them, with a turning female-ſcrew on each, to force the plates together. Theſe being brought evenly together, by means of the ſcrews, will take off a true and fair picture of the medal; which, if any deficiencies ſhould appear, may eaſily be repaired with a hair pencil, or pen, dipped in the colour made uſe of.

If a relievo only be deſired, nothing is neceſſary, but to take a piece of card, or white paſte-board, well ſoaked in water; then placing it on the wax-mould, without any colouring, and letting it remain in the preſs for a few minutes, a good figure will be obtained.

This method of taking off medals, *&c.* is convenient, and ſeems much more ſo than the ſeveral inventions uſually practiſed in ſulphur, plaſter of Paris, paper, *&c.* wherein a mould muſt be formed, either of clay, horn, plaſter, or other materials, which requires a good deal of time and trouble.

MEDALLION, or MEDALION, a medal of an extraordinary ſize, ſuppoſed to be anciently ſtruck by the emperors for their friends, and for foreign princes and embaſſadors; but that the ſmallneſs of their number might not endanger the loſs of the devices they bore, the Romans generally took care to ſtamp the ſubject of them upon their ordinary coins.

Medalſions, in reſpect of the other coins, were the ſame as modern medals in reſpect of modern money: they were exempted from all commerce, and had no other value but what was ſet upon them by the fancy of the owner. Medallions are ſo ſcarce, that there cannot be any ſet made of them, even though the metals and ſizes ſhould be joined promiſcuouſly.

MEDELPADIA, a ſmall province of Sweden lying northward of Helſingia.

MEDEOLA, in botany, a genus of the hexandria trigynia claſs. It has no calix; the corolla conſiſts of ſix revoluted ſegments; and the berry contains three ſeeds. There are two ſpecies, none of them natives of Britain.

MEDIA, in geography, the ancient name of Gilan. See GILAN.

MEDIANA. See ANATOMY, p. 241.

MEDIASTINUM, in anatomy. See ANATOMY, p. 278.

MEDIATE, or INTERMEDIATE, ſomething that ſtands between and connects two or more terms, conſidered

as extremes; in which ſenſe it is oppoſed to immediate.

MEDICAGO, in botany, a genus of the diadelphia decandria claſs. The pod is compreſſed; and the carina of the corolla declines from the vexillum. There are nine ſpecies, four of them natives of Britain, *viz.* The falcata, or yellow medic; the ſativa, or lucern; the lupulina, or melilot trefoil; and the arabica, or heart-trefoil.

MEDICINE.

MEDICINE is generally defined to be, The art of preſerving health when preſent, and of reſtoring it when loſt.

Men would never think of any particular regimen or mode of living in order to preſerve health, before they felt the pains which accompany the want it. The firſt painful ſenſation muſt neceſſarily have produced a deſire for relief. But in a period when phyſicians and medicines were equally unknown, how was that relief to be obtained? or what ſyſtem of conduct would man in this ſituation naturally follow? Whoever can anſwer theſe queſtions, will unfold the genuine principles of the medical art, and give an infallible ſtandard for judging what progreſs has been made in the improvement of it, what particular circumſtances have contributed to obſtruct or forward the knowledge and cure of diſeaſes.

Medicine being thus founded on a powerful inſtinct in human nature, its exiſtence in ſome form muſt have been coeval with the firſt diſeaſe that appeared among mankind. Moſt arts require the experience of ages before they can arrive at a high degree of perfection. Medicine is unqueſtionably one of the moſt ancient; and conſequently, the improvement of it might be expected to bear ſome proportion to its antiquity. But, whilſt philoſophy, in all its branches, has been cultivated and improved to a great extent; medicine, notwithſtanding the collateral advantages it has of late derived from anatomy and other ſciences, ſtill continues to be buried in rubbiſh and obſcurity.

Many cauſes have contributed to retard our progreſs in the knowledge of the cauſes and cure of diſeaſes. In the early ages, preſcriptions were either the reſult of tradition founded upon uncertain facts, or mere random trials without any rational view of ſucceſs: Accordingly, when any uncommon caſe occurred, the patients were placed in croſs-ways, and other public places, to receive the advice of paſſengers who might chance to know the diſeaſe or an efficacious remedy. In this way valuable medicines might be accidentally diſcovered. But memory, and, in remarkable cures, engravings on pillars or the walls of temples, were poor inſtruments for recording the ſymptoms of diſeaſes, and the ingredients of preſcriptions.

After the knowledge of medicine began to be ſtudied and practiſed as a liberal profeſſion, a jealouſy of reputation, joined to a thirſt for money and ignorance of philoſophy, laid a ſolid foundation for medical diſputation. One party of phyſicians, known by the name of Empyrics, excluded all reaſoning, and truſted ſolely to experience. Another party, called Dogmatiſts, maintained, that no man ought to preſcribe, without being able to give a theory both of the diſeaſe and of the nature and action of the medicine. This diſpute continued for ages, and, like other diſputes of a ſimilar nature, remains ſtill in ſome meaſure undecided. The principles of both theſe parties are unqueſtionably good. But the phyſician who excludes either of them, will make but little progreſs in the knowledge of his profeſſion. A judicious mixture of the two is indiſpenſably neceſſary. Indeed it is difficult to determine whether too great an attachment to empyriciſm or dogmatiſm has contributed moſt to obſtruct the improvement of phyſic.

But there is one cauſe which has operated more powerfully in preventing the improvement of medicine than even a combination of all the other cauſes. Moſt branches of philoſophy are principally cultivated by people who expect their reward in reputation, not in money. The practice of phyſic is become as literally a trade as any branch of buſineſs whatever. Young men are taught phyſic with no other view than that of gaining their bread. Whenever a phyſician gets into extenſive practice, he may buſtle and make a noiſe; but, even ſuppoſing his abilities to be great, he can never find leiſure to think, or digeſt his obſervations.

Another cauſe of the imperfect ſtate of medicine ariſes from the varieties in conſtitutions, and the complex nature of diſeaſes. It is even extremely difficult, after a diſeaſe has been cured, to determine with certainty, whether the cure was performed by the operation of nature, or by any particular virtue in the medicine. This difficulty is greatly increaſed by the variety of different medicines, and different ingredients in the ſame medicine, which are commonly adminiſtred during the courſe of a diſeaſe.

Of late ſeveral attempts have been made to reduce medicine into the form of a regular ſcience, by diſtributing diſeaſes into claſſes, orders, genera, and ſpecies. Sauvage was the firſt, and indeed the only perſon who ever attempted to complete this great work. Others, as Linnæus, Vogel, Dr Cullen, *&c.* have ſince endeavoured to improve Sauvage's method of claſſing; but they have contented themſelves with an enumeration of the characters and arrangement of the different genera, without entering into their hiſtory or cure. Sauvage enumerates 315 genera, Linnæus 325, Vogel 560, and Dr Cullen has reduced them to 132. The bare inſpection of theſe numbers ſhews, that phyſicians are far from being agreed with regard to what conſtitutes the generic or ſpecific characters of a diſeaſe. Indeed, we may venture to affirm, that they never will agree upon this point: The diagnoſtic ſymptoms of diſeaſes are not ſo eaſily diſcovered as the ſtamina or petals in a flower, or the number of teeth or toes in

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in a quadruped. However, before making any obſervations on the advantages or diſadvantages that may probably reſult from the claſſification of diſeaſes, we ſhall lay before our readers the laſt and ſhorteſt diſtribution, publiſhed laſt year by Dr Cullen, one of the profeſſors of medicine in the univerſity of Edinburgh, under the title of *Synopſis Noſologiæ Methodicæ*, or rather, *Genera Morborum Præcipua*.

The doctor divides diſeaſes into the four following claſſes, *viz.*

Class. I. Pyrexiæ, or Feveriſh Diſorders.
II. Neuroses, or Nervous Diſeaſes.
III. Cachexiæ; comprehending ſuch diſorders as proceed from a diſeaſed ſtate of the whole or any part of the body, without an original fever, or any nervous complaint.
IV. Locales; comprehending diſeaſes which affect a part only, not the whole body.

The *firſt* claſs (Pyrexiæ) is ſubdivided into five orders, *viz.*

Order I. Febres, or Fevers, is ſubdivided into two ſections, *viz.* 1. Intermittent; and, 2. Continued fevers.—The firſt ſection contains three genera, *viz.* 1. The Tertian fever; 2. The Quartan; 3. The Quotidian:—The ſecond ſection likewiſe contains three genera, *viz.* 1. The Synocha; 2. The Typhus; 3. The Synochus.

Order II. Phlegmasiæ, or fevers accompanied with any local pain. This order contains 17 genera, *viz.* 1. Phlegmone; 2. Ophthalmia; 3. Phrenitis; 4. Cynanche; 5. Peripneumonia; 6. Pleuritis; 7. Carditis; 8. Peritonitis; 9. Gaſtritis; 10. Enteritis; 11. Hepatitis; 12. Splenitis; 13. Nephritis; 14 Cyſtitis; 15. Hyſteritis; 16. Rheumatiſmus; 17. Arthritis.

Order III. Exanthemeta, or eruptive fevers; comprehending 10 genera, *viz.* 1. Eryſipelas; 2. Peſtis; 3 Variola; 4. Varicella; 5. Rubeola; 6. Miliaria; 7. Scarlatina; 8. Urticaria; 9. Pemphigus; 10. Aphtha.

Order IV. Hæmorrhagiæ, or fevers accompanied with a flux of blood, not proceeding from any external cauſe. This order comprehends 4 genera, *viz.* Epiſtaxis; 2. Hæmoptyſis; 3. Hæmorrhois; 4. Menorrhagia.

Order V. Profluvia, or fevers attended with an increaſed ſecretion, not naturally of the bloody kind. This order contains 2 genera, *viz.* 1. Catarrhus; 2. Dyſenteria.

The *ſecond* claſs (Neuroses) is ſubdivided into four orders, *viz.*

Order I. Comata, or lethargic diſeaſes; containing 3 genera, *viz.* 1. Apoplexia; 2. Paralyſis; 3. Catalepſis.

Order II Adynamiæ, or diſeaſes ariſing from a ſtoppage or diminution in any of the involutary motions, whether vital or natural. This order contains 4 genera, *viz.* 1. Syncope; 2. Dyſpepſia; 3. Hyponchondriaſis: 4 Chloroſis.

Order III. Spasmi, or irregular motions of the muſcular fibres. This order contains 13 genera, *viz.* 1. Tetanus; 2. Convulſio; 3. Epilepſia; 4. Palpitatio; 5. Aſthma; 6. Pertuſſis; 7. Pyroſis; 8. Colica; 9. Cholera; 10. Diarrhœa; 11. Diabetes; 12. Hyſteria; 13. Hydrophobia.

Order IV. Vesaniæ, or diſeaſes of the mind, without a fever or coma. This order contains 4 genera, *viz.* 1. Amentia; 2. Melancholia; 3. Mania; 4. Somnium.

The *third* claſs (Cachexiæ, or diſeaſes ariſing from a depraved ſtate of the whole or a great part of the body, without a fever or nervous complaint,) is ſubdivided into 3 orders, *viz.*

Order I. Marcores, or diſeaſes attended with a waſting of the whole body; containing 2 genera, *viz.* 1. Tabes; 2. Atrophia.

Order II. Intumescentiæ, or diſeaſes accompanied with an external ſwelling of the whole or a great part of the body. This order contains 13 genera, *viz.* 1. Polyſarcia; 2. Pneumatoſis; 3. Tympanites; 4. Phyſometra; 5. Anaſarca; 6. Hydrocephalus; 7. Hydrorachitis; 8. Hydrothorax; 9. Aſcites; 10. Hy-drometra; 11. Hydrocele; 12. Phyſconia; 13 Rachitis.

Order III. Impetigines, or diſeaſes attended wth a cachexy which deforms the ſkin and external parts of the body. This order contains 8 genera, *viz.* 1. Scrophula; 2. Syphilis; 3. Scorbutus; 4. Elephantiaſis; 5. Lepra; 6. Frambæſia; 7. Trichoma; 8. Icterus.

The *fourth* claſs (Locales, or diſeaſes affecting only a part of the body,) is ſubdivided into ſeven orders, *viz.*

Order I. Dysæsthesiæ, or diſeaſes ariſing from any of the ſenſes being deſtroyed or impaired by a fault in the external organs of ſenſation. There are 8 genera in this order, *viz.* 1. Caligo; 2. Amblyopia; 3. Dyſecœa; 4. Paracuſis; 5. Anoſmia; 6. Ageuſtia; 7. Anæſtheſia; 8. Anaphrodiſia.

Order II. Dyscinesiæ, or diſeaſes attended with the deſtruction or defect of motion in any part through a fault of the organs. This order contains 6 genera, *viz.* 1. Aphonia; 2. Mutitas; 3. Paraphonia; 4. Pſelliſmus; 5. Strabiſmus; 6. Contractura.

Order III. Apocenoses, or diſeaſes attended with an increaſed flux of the blood or other humours, without a fever, or increaſed motion of the fluids. This order contains 5 genera, *viz.* 1. Profuſio; 2. Epiphora; 3. Ptyaliſmus; 4. Enureſis; 5. Gonorrhœa.

Order IV. Epischeses, or diſeaſes ariſing from a ſuppreſſion or obſtruction of any uſual excretions. This order contains 3 genera, *viz.* 1. Obſtipatio; 2. Iſchuria; 3. Amenorrhœa.

Order V. Tumores, or diſeaſes attended with an increaſed ſize of the part, without a phlegmon. This order contains 14 genera, *viz.* 1. Aneuriſma; 2. Varix; 3. Ecchymoma; 4. Schirrus; 5. Cancer; 6. Bubo; 7. Sarcoma; 8. Verruca; 9. Clavus; 10. Lupia; 11. Ganglion: 12. Hydatis; 13. Hydrarthrus; 14. Exoſtoſis.

Order VI. Ectopiæ, comprehending diſeaſes ariſing

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ſing from any part's being removed from its proper ſituation, and cauſing a tumor. This order contains 3. genera, *viz.* 1. Hernia; 2. Prolapſus; 3. Luxatio.

Order VII. Dialyses; comprehending ulcers, and all kinds of wounds. This order contains 7 genera, *viz.* 1. Vulnus; 2. Ulcus; 3. Herpes; 4. Tinea; 5. Pſora; 6. Fractura; 7. Caries.

It is needleſs to enter into an examination of the propriety or impropriety of this or any of the other modes of diſtribution. Every one of them are defective in many particulars. Sauvage, Vogel, Linnæus, Dr Cullen, have each adopted peculiar theories of particular diſeaſes. Theſe theories conſtitute the baſis of their different claſſifications. A perſon, therefore, who is not previouſly acquainted with theſe theories will naturally be ſurpriſed to find ſome diſeaſes arranged under certain claſſes and orders. For example, who would expect to find a diarrhœa ranked under the claſs of Neuroſes, and in the order of Spaſmi, without knowing Dr Cullen's particular theory concerning the cauſe of that diſeaſe? The generic characters of many diſeaſes will likewiſe be totally unintelligible to ſuch a perſon.

However, notwithſtanding theſe defects ariſing from the theoretical diſtribution of diſeaſes, we cannot heſitate a moment in preferring even a bad method of claſſing to none at all. Every attempt towards a juſt and natural arrangement of diſeaſes is laudable, and has a direct tendency to introduce ſcience into the medical art; an object greatly to be wiſhed for, but which ſtill appears to be very diſtant. There is, however, a danger attending attempts of this kind which deſerves to be pointed out. In every art which is not founded upon known facts and eſtabliſhed principles, new projects are eagerly graſped at; and, though they lead to error and falſe reaſoning, it is long before the profeſſors of that art can be induced to give over the purſuit. This obſervation is peculiarly applicable to medicine. The theories of diſeaſes, as well as the mode of preſcription, are as variable as the faſhions of a lady's head-dreſs. No other argument is neceſſary to ſhew the crude ſtate of the art, and the boundleſs field for improvement. Now, the great danger ariſing from the claſſing of diſeaſes is this:—It will divide phyſicians, in the firſt place, into two great parties: the one party will ſpend much time and genius in ſhewing the uſeleſſneſs of claſſing in general, and particularly in the preſent imperfect ſtate of the art; the other will imitate their example in defending with equal keenneſs. Nay, what is ſtill worſe, every profeſſor belonging to this laſt party, beſides ſpending much time to little purpoſe in juſtifying claſſification in general, will conſume ſtill more time in criticiſms upon every other mode of claſſing beſides the one he chuſes to adopt. Now, this buſtle about claſſification among the teachers of medicine, will naturally lead the minds of unexperienced ſtudents to conclude, that the whole ſcience conſiſts in a particular arrangement of diſeaſes, and that they cannot make a more proper diſplay of their medical knowledge, than by diſcovering an acquaintance with all the various methods of claſſification, and an acuteneſs in criticiſing all the other methods but that particular one which he has been taught to believe as infallible.

Having thus given a ſhort account of the origin and preſent ſtate of phyſic, we ſhall now proceed to the hiſtory and treatment of diſeaſes.

Of Fevers *in general.*

Hoffman defines a fever to be, "A ſpaſmodic affection of the whole nervous and vaſcular ſyſtem, annoying all the functions of the body, ariſing from any cauſe which has power to irritate the nervous parts to a more intenſe contraction; and when it operates, it drives the vital fluids from the outward parts to the heart and great veſſels; and afterwards, when the ſyſtole of the heart and arteries are increaſed, they are drove back with rapidity and heat, through the conſtricted veſſels, to the outward parts again, till the ſpaſms being relaxed, the ſecretions are performed, and the fever vaniſhes."

The formal or fundamental cauſe of a fever conſiſts in the ſpaſmodic affection of the whole nervous and fibrous genus. This plainly appears from the uſual phænomena of a fever, *viz.* a pain in the back, more particularly about the loins; a coldneſs, eſpecially of the extreme parts; a ſhivering, ſhaking, trembling; a livid colour of the nails; a ſubſidence of the veſſels of the hands and feet; a ſhrunk, dry ſkin; a yawning; a ſtretching; a pale, livid countenance; a trembling and palpitating motion of the heart; an anxiety of the præcordia, difficult breathing, inquietude, reſtleſſneſs; a ſenſation of an ebullition of the blood about the heart; a contracted, weak, ſmall pulſe; a nauſea, and an inclination to vomit; a ſuppreſſion of perſpiration; coſtiveneſs, with thin watery urine.

Hence it naturally follows, that whatever has a power to irritate and ſolicit the nervous and vaſcular ſyſtem to ſpaſms, is moſt likely to generate a fever. To this claſs belong violent paſſions of the mind, eſpecially terror and anger; a poiſonous, ſubtle, cauſtic matter, either bred within the body, or received by infection; a ſtoppage of perſpiration; a ſuppreſſion of critical ſweats; eruptions driven back; an abundance of purulent ulcerous matter adhering to various parts; aliments too acrid and ſharp; corrupt and bilious crudities lodged in the primæ viæ; exceſſive watching; a violent pain and tenſion of the nervous parts; inflammations, tumours, and abſceſſes; hurting the nervous parts by ſharp inſtruments; acrid and corroſive drugs; cold baths, and, on the contrary, thoſe that are too hot or aſtringent.

According to the different nature of theſe cauſes, and the various manner of affecting the nerves, ariſe fevers of divers kinds. Some are benign, others malignant; ſome are intermitting, others continual; ſome are ſimple, others compound; others regular or anomalous; eruptive, ſpotted, putrid, hectic, or ſlow. Some admit of an eaſy cure, others a difficult; ſome ſoon terminate, others are protracted a long time; and many hurry the patient ſuddenly out of the world.

Yet, every frequent ſyſtole of the heart and arteries diſcoverable by the pulſe ought not to be called a fever. For theſe may often ariſe from violent bodily exerciſe; or, from a commotion in the blood cauſed by hot and ſpirituous liquors. That only which ariſes from internal cauſes, and is preceded by ſhivering, ſhaking, and coldneſs

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neſs of the extreme parts, is properly a fever: For there is always, as it were, a double motion in a fever; the one from the circumference to the centre, or from the external parts to the internal, the heart and lungs; the other from the centre to the circumference. The firſt motion is attended with a ſmall, contracted, weak, pulſe, with an anxiety of the præcordia and difficulty of breathing; the ſecond with an increaſed motion of the arteries, a large pulſe, and heat extended even to the extreme parts.

The cauſe of the febrile motion is an univerſal ſpaſm; and that motion never ceaſes till the ſpaſm is reſolved. The ſigns of its being reſolved are, a free perſpiration, and a breathing ſweat; the pulſe, which before was hard, impetuous, and quick, becomes ſoft, moderate, and ſlow; the urine lets fall a ſediment, and the ſtrength gradually returns. When theſe appear all together, they declare the ſolution of the diſeaſe, and are called the criſis.

Of INTERMITTING FEVERS, *or* AGUES.

THIS fever is of the regular kind, and is attended with the following ſymptoms. At firſt, the head aches, the limbs ſeem weary; there is a pain in the loins about the firſt vertebra of the back, which aſcends towards the epigaſtrium, with a painful ſenſe of a tenſion in the hypochondria, and coſtiveneſs: then comes on a coldneſs of the external parts, eſpecially of the noſe and ears; a ſtretching, yawning; a ſhivering and ſhaking, ſometimes even to make the bed tremble under the patient; the pulſe is ſmall, contracted, and weak: again the patient is troubled with thirſt; then follows a nauſea, with a fruitleſs reaching to vomit; again, a pituitous, bilious, or green matter is brought up, commonly joined with a troubleſome cough, and an expectoration of phlegm derived from the acid clammy crudities of the ſtomach; to theſe ſucceeds an anxious burning and dry heat, which pervades the whole body. The face, which was collapſed and pale, the contracted, rigid ſkin, and the empty veſſels of the hands and feet, begin to riſe, and grow red and turgid; the pulſe becomes more great, full, and quick; the reſtleſſneſs increaſes, the breathing is more difficult, and the patient, with his eyes almoſt cloſed, begins to talk a little wildly.

Afterwards, the ſymptoms begin to abate, the heat becomes mild, the ſkin relaxes and grows moiſt; the urine is of a flame colour, but without a ſediment; the pulſe is more moderate; and then a ſweat breaking out, terminates the paroxyſm. The duration of the fit is uncertain; ſometimes it ends in ten or eleven hours, and ſometimes not till twenty-four. On the intercalary day, the body is ſtill feeble and coldiſh, with a diſpoſition to ſhiver; the pulſe is ſlow and weak; the urine is turbid, and depoſites a ſediment, or there is a nubecula which ſhews a diſpoſition thereto.

In the BASTARD or SPURIOUS TERTIAN, the ſymptoms are milder, the heat is not ſo burning, the vomiting is not ſo frequent, and the urine is not ſo high-coloured; but then it is a more lingring complaint, and on the well day there is a laſſitude and want of appetite. This attacks men of an inactive diſpoſition, and women whoſe bodies are of a looſe texture, in the autumnal ſeaſon.

The fit of the IRREGULAR TERTIAN obſerves no particular time; for it ſometimes comes on in the morning, ſometimes in the afternoon, in the evening, or at midnight. The paroxyſm is ſometimes longer, ſometimes ſhorter; the urine lets fall no ſediment within the time of remiſſion or intermiſſion; the ſweating is either too ſparing or too profuſe. When the fit is off, ſeveral unuſual ſymptoms may appear; as, a looſeneſs, a bleeding at the noſe, ſickneſs at the ſtomach, a violent heartburn, pains in the belly, or the gripes. Theſe ſort of agues are generally EPIDEMIC, and moſt commonly appear in the ſummer and autumn.

Sometimes a tertian ague is DOUBLE, which may be diſtinguiſhed from a quotidian, by the time of the fits, which is not the ſame every day, but every other day.

There is ſometimes a CONTINUAL TERTIAN, which begins with ſhivering and ſhaking, an anxiety, vomiting, loſs of ſtrength, and then a violent heat. The fits do not intermit, but only remit. The pulſe continues frequent with heat and debility, and all the ſymptoms return with freſh vigour every other day; but at length admit a perfect intermiſſion.

An ENDEMIC TERTIAN is proper to certain places; as a low ſituation, and full of marſhes, producing a great number of gnats and other inſects, like ſome parts of Kent, and the hundreds of Eſſex. In ſuch places, the natives themſelves have a little of it every year; and ſtrangers ſeldom or never eſcape, without a preſervative, which is only the bark infuſed in brandy, with a little ſnake-root, of which two ounces night and morning are to be taken.

A QUARTAN AGUE has two fits in four days, or two days quite free from a fit.

It begins about four or five in the afternoon, ſometimes ſooner and ſometimes later, with a great laſſitude, ſtretching, a blunt pain in the head, back, loins and legs; the feet and hands are cold; the whole body is pale; the face and nails livid, to which ſhivering and ſhaking ſupervene. The tongue and the lips tremble, the breathing is difficult, with reſtleſſneſs and toſſing; the pulſe is contracted and hard, and ſometimes unequal; and there is an anxiety about the præcordia. Theſe ſymptons continue about two or three hours. In ſome the body is coſtive; in others there is a ſtimulus to ſtool, and to make water. In ſome there is a nauſea or vomiting, with ſtools. Some advanced in years have their minds pretty much diſturbed; the heat comes on gradually, not burning but dry; the pulſe becomes equal, quick, and large; but the dull pain in the head remains, with a vertiginous affection; the ſkin becomes only a little moiſt; and in about four or ſix hours the ſymptoms vaniſh, except a dull pain in the bones, joints and feet. The urine in the fit is ſometimes thin and watery, ſometimes thick and with a ſediment.

Sometimes a quartan ague is DOUBLE, that is, when the fits come on every other day at different hours; and it is SPURIOUS when a paroxyſm begins at any other time of the day but that above-mentioned. It is ſaid to be CONTINUAL, when on the intercalary days there are ſhiverings and pandiculations, with a greater heat than uſual, a quicker pulſe, a want of appetite, a debility, a dryneſs of the mouth, a lightneſs of the head, a diſturbed

ed ſleep, and a reddiſh urine, with a thick roſe-coloured ſediment.

A QUOTIDIAN AGUE or fever returns every day, and is not ſo common as the tertian or quartan.

The acceſſion of this fever is about four or five in the morning, with cold and ſhivering; to which ſucceeds a cardialgic nauſea, and inflation of the belly; in ſome, a pain in the head; in others, fainting fits; in moſt, vomiting or ſtools, or both. Then comes on a moderate heat, with thirſt, but not very intenſe. The pulſe, which was before irregular and weak, becomes more quick, but not very hard. The urine is not of a flame but rather of a citron colour, and turbid. Some are exceeding ſleepy. At length a moderate ſleep ſupervenes; and in about ten hours or longer, the fit goes off, leaving the body dull and heavy.

From theſe ſymptoms it appears, that the whole nervous ſyſtem is agitated and ſuffers greatly by ſpaſtic conſtrictions; which proceeding chiefly from the medulla ſpinalis, affect preternaturally not only the coats of the veſſels, but all the fibres throughout the body, thereby greatly diſturbing the motion both of the ſolids and fluids.

The material cauſe of this, and all other fevers, according to Hoffman, is a fluid of an active nature, endued with a cauſtic acrimony, which ſolicits the internal and exquiſitely ſenſible parts to ſpaſtic contractions. It is generated chiefly in the biliary ducts and flexures of the duodenum; where the vitiated, bilious ſalival and pancreatic juices meeting with the crudities of a bad digeſtion, ferment together, and, not being timely expelled, become virulent. This matter paſſing through the lacteals, into the blood, and thence into the nervous parts of the head, medulla ſpinalis, inteſtines, and ſtomach, as alſo to the nervous coats of the excretory and ſecretory ducts, excite an univerſal ſpaſm, which firſt forces the blood to the interior and greater veſſels; and afterwards the ſyſtaltic motion of the heart and arteries being increaſed, the motion of the whole maſs of blood and humours is accelerated, and the obſtructions of the ſmall veſſels of the nervous parts are opened; upon which the ſpaſm ceaſing, the excretory ducts are relaxed, the febrile matter paſſes off through the pores of the ſkin by perſpiration or ſweat, and the fit ceaſes, till by the generation of freſh matter a new paroxyſm is brought on.

As to the cure, when a load of vitiated humours in the ſtomach and duodenum require depletion, which is known from having indulged in too plentiful eating, from an anxiety of the præcordia, from eructations, and a bitter taſte in the mouth, a vomit, after the firſt fit, in the time of intermiſſion, is to be given. In tender conſtitutions, 10 grains of ipecacuanha may be given alone; but to the more robuſt, a grain or two of emetic tartar may be added. Or if it is neceſſary to purge at the ſame time,

1. Take half an ounce of Epſom ſalt, and two or three grains of emetic tartar. Mix them and make them into a powder; to be diſſolved in a pound of pure lukewarm water, and taken two hours after the fit.

The evacuation ought to be facilitated with draughts of water-gruel made fat with freſh butter. Then take the following electuary, which will cruſh the diſeaſe in the bud.

2. Rob of elder, one ounce; 5 drams of Peruvian bark; 2 drams of chamomile flowers in powder; extract of the leſſer centaury, and powder of jelliflowers, of each half a dram; add as much ſyrup of lemon as will make an electuary. Half a dram to be taken every two hours, after the fit has gone off.

But if any thing forbids vomiting, and yet there is plenty of ſerous crude humours which require evacuation, we muſt begin the cure with deterſive and aperient ſalts.

When the whole inteſtinal canal has been cleanſed by theſe ſalts, duely repeated at proper intervals, and the ague ſtill continues, add an equal weight of bark thereto, or give the electuary above preſcribed.

When the patient is obnoxious to the hypochondriac paſſion, the ſtomach inflated, and the body coſtive, neither vomits nor ſalts muſt be ventured upon, but carminative and emollient clyſters.

But it muſt be remembered, that neither bleeding, nor emetics, nor cathartics, nor the bark, nor any ſtrengthener nor aſtringent is to be adminiſtered or given in the fit, or near the time it uſually comes on.

If a tertian is autumnal, obſtinate, or changes to a quotidian, the antifebrile potion of Crollius will be proper.

3. Salt of wormwood, a dram; ſpirit of ſulphur, a ſcruple; 4 ounces of fennel water. Mix them together for a drink.

Let the patient take it juſt as the fit comes on, and be well covered with bed-cloaths.

Bleeding is proper only in a hot ſeaſon, when the heat of the patient is exceſſive, attended with a delirium, and in the prime of life, full of blood, and ſubject to paſſion.

Opiates will appeaſe the ſymptoms; but they diſturb the criſis, and protract the diſeaſe. Likewiſe aluminous, chalybeate, and vitriolic remedies will ſtop the fits; and if they are given to patients of the loweſt claſs, care muſt be taken that they ſweat after them, by drinking hot decoctions, or by exerciſe.

Abſorbents have often a happy effect in theſe diſeaſes; but if given in too great a quantity, they will not diſſolve in the ſtomach. Harris adviſes 2 ſcruples of the ſimple powder of crabs claws, two hours before the fit, and to be repeated in an hour, in mint-water; no ſmall beer is to be drank for eight hours after. It may be repeated in the ſame manner againſt the next time the fit is expected; as likewiſe a third time.

Langriſh aſſerts, that in long continued agues or intermitting fevers, which have baffled the bark and many other medicines, he has met with more advantage from rhubarb and calomel exhibited in ſmall doſes, than from any thing elſe he had tried.

To prevent the return of an ague, the bark muſt be repeated every week or ten days, for three ſeveral times, with the ſame intervals. Likewiſe bitters and chalybeates are very ſerviceable for the ſame purpoſe.

Of the CATARRHAL FEVER, *or the* Continual Quotidian *of the ancients.*

IT generally begins in the evening, with a ſhivering and

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and a coldneſs of the extreme parts, eſpecially of the feet, and ſoles of the feet; a coſtiveneſs; a frequent deſire of making water, but the urine is ſmall in quantity; a weakneſs of the head, an univerſal languor of the whole body, a falſe appetite, thirſt, difficulty of ſwallowing, a ſtimulus in the larynx; a heat in the noſtrils and fauces, attended with ſneezing; a weight in the breaſt: towards night, heat, and a quicker, fuller pulſe, with a defluxion of rheum, a heat in the fauces, unquiet ſleep, a ſweating in the morning, a heavineſs and dulneſs of the whole body, and a loſs of appetite.

The immediate cauſe of this diſorder is a ſharp acrid ſerum or lympha, ſubſiſting in the glandulous tunics, and irritating them with pain, tumour, and redneſs. This happens in the whole region of the noſtrils, palate, and fauces; as alſo in the aſpera arteria, with the bronchial branches; and farther in the oeſophagus, ſtomach, and inteſtines. Hence a hoarſeneſs, a cough, a hawking up of viſcid matter, a ſneezing, a defluxion of the lungs: likewiſe a nauſea, ſometimes a vomiting; a heat about the præcordia; a griping of the guts, followed with a ſalutary flux.

It more frequently attacks women and children than men, and thoſe that indulge themſelves in ſtrong liquors. It ſometimes happens from the drying up of a ſcald head and other eruptions. Sometimes it is epidemical.

This diſeaſe is moſt frequent in the ſpring and autumn, in ſudden changes of the weather from hot to cold, from dry to moiſt, and *vice verſa*; as alſo from change of air, if of different qualities; from being expoſed to the cold air of the night, and from throwing off winter-garments too ſoon.

This diſeaſe is not dangerous in itſelf, if rightly managed, and terminates in ſeven or fourteen days at fartheſt: for the laſſitude of the body then diſappears; and the other complaints, eſpecially the head-ach and hemicrania are appeaſed, when the catarrh appears, and there is a plentiful diſcharge from the noſtrils.

It often goes off, in ſome, in the beginning, with an increaſed perſpiration or by ſweat; in others after a few days, by hawking up a large quantity of viſcid matter, or a plentiful diſcharge of a mucous ſerum by the noſe; in others, by a looſeneſs, when the urine at the ſame time, which before was thin and little, becomes copious and heavy, with twice the quantity of ſediment as in a natural ſtate.

The intentions of cure are three, 1. To ſheath the acrimony of the lympha. 2. To increaſe perſpiration. 3. To promote the expectoration of the viſcid mucus.

The ſaline ſharpneſs of the lympha may be taken off by the abſorbent and diaphoretic powders, humecting and oleous remedies; ſuch as, oil of ſweet almonds, ſperma ceti, milk, cream, almond emulſions, with the addition of white poppy ſeeds, barley-broth, water-gruel, chicken-broth, with the yolk of an egg; as alſo liquorice-juice, liquorice-tea, dried figs and raiſins. If the acrimony is very ſubtle and corroding, gentle anodynes ſhould take place, ſuch as ſaffron, diacodium, and ſtoax pills.

To promote a diaphoreſis,

1. Take a ſcruple of the powder of contrayerva; Virginian ſnake-root and ſaffron, of each 5 grains. Mix and make them into a powder. To be repeated in 4 or 6 hours, if neceſſary.

To appeaſe the cough,

2. Take oil of olives, an ounce and a half; pure water, 6 ounces; ſpirit of hartſhorn, 40 drops; pectoral ſyrup, one ounce. Mix them, and take a ſpoonful every four hours.

To promote perſpiration, order tea, with leaves of veronica, hyſſop, liquorice-root, elder flowers, wild poppies, and fennel ſeeds; as alſo the more fixed diaphoretic powders, with antiſpaſmodic waters; but eſpecially bodily motion and exerciſe.

To promote the excretion of the thick, viſcid mucus, figs and raiſins are proper, with brandy burnt, and reduced almoſt into a ſyrup. Likewiſe a pectoral elixir, made of gum ammoniac, myrrh, liquorice-root, elecampane-root, ſaffron, benjamin, and oil of anniſeed, whoſe virtue may be heightened by the vinous ſpirit of ſal ammoniac or tincture of tartar. The ſtagnating mucus of the noſe may be diſſolved by often holding to the noſe the dry volatile ſal ammoniac, mixed with a few drops of genuine oil of marjoram.

The regimen ſhould be temperate; and cooling things, as well as acids, ſhould be avoided.

The aliment ſhould be ſparing, the drink warm and wholeſome; the beſt is a decoction of pearl-barley and ſhavings of hartſhorn, as alſo water-gruel.

If the body is coſtive; beſides water-gruel, manna, prunes, and raiſins, nothing is better than an emollient clyſter.

In the decline of the diſeaſe, when the cough is too moiſt, the defluxion great and obſtinate, it will be proper to take a large doſe of manna, to two or three ounces in fennel-water, to carry the humours downward.

When the cough is very violent, it muſt be appeaſed with a mixture of oil of ſweet almonds freſh drawn, and French ſyrup of capillaire.

When women labour under a ſuppreſſion of the menſes, the body muſt be kept open with clyſters; bezoardic powders muſt be given, and a grain of ſaffron added to each doſe, or a few grains of flowers of ſulphur; but avoid ſweet things and expectorants.

When the fever is vanquiſhed, and the lungs continue in a lax ſtate, which is known from too large a ſpitting, to the bezoardic powders muſt be added a few grains of cortex eleutheriæ.

In a violent obſtinate cough, ſweet pectorals, and incraſſating remedies too plentifully given, bring on a cachexy, or phthiſis, by ſpoiling the appetite, and hurting the tone of the lungs. HOFFMAN.

What we commonly call CATCHING COLD, may be cured by lying much in bed; by drinking plentifully of warm ſack-whey, with a few drops of ſpirit of hartſhorn, poſſet-drink, water-gruel, or any other warm ſmall liquor; living upon ſpoon-meats, pudding, and chicken, and drinking every thing warm: In a word, treat it at firſt as a ſmall fever, with gentle diaphoretics; and afterwards, if any cough or ſpitting ſhould remain, by ſoftening the breaſt with a little ſugar-candy and oil of ſweet almonds, or a ſolution of gum ammoniac in an ounce of barley-

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barley-water to make the expectoration eaſy, and afterwards going into the air well cloathed.

Of the Semitertian Fever.

This is an epedemic fever, compounded of an intermitting tertian and a continual quotidian.

It generally makes its onſet before noon, with coldneſs, ſhaking, and a contracted pulſe; to which ſucceeds a frequent pulſe, with heat, which continues ſome hours, till a warm ſweat appears, without a complete intermiſſion. The heat, after a ſlight chilneſs, increaſes towards night, with a quick pulſe; which is more moderate the next day, without thirſt, till the evening, when a ſlight ſhivering comes one, and the ſymptoms return. On the third day, the ſhaking fit appears again with more intenſe heat, and proceeds in the ſame track as before; ſo that the fever is never quite off, but has an exacerbation in the evening: however, the ſhaking fit is moſt conſpicuous every third day in the morning.

Beſides the foregoing ſymptoms, the ſtrength fails, the appetite is languid, ſleep is wanting, the urine is thin and crude; but after the fit on the third day, it is thick and coloured, and a ſmall quantity of crude matter is brought up with coughing. It is ſometimes attended with a pain in the back and the abdomen, together with a ſwelling in the latter. Some at the acceſs of the fit of the tertian, are affected with a naufea and cardialgia. Some vomit, others faint, and others again are delirious.

This fever is generated by all things that render the humours thick and impure, eſpecially thoſe that fill the primæ viæ, and the veſſels of the meſentery, with impurities. Thoſe are moſt liable to it who live upon ſweet, acid, and fermentable aliment, that live an idle ſedentary life, that drink leſs than they ought, or love ſweet wines; as alſo thoſe that give way to ſadneſs and melancholy.

It generally terminates either on the ninth or thirteenth day, in health, or another diſeaſe, or death.

It is a good ſign when a ſweat breaks out at the decline of the paroxyſm, and when, on the ſeventh day, being critical, or, after it, the belly is diſturbed, and is followed with a flux of a bilious, pituitous, or bloody matter, for it foretels the ſolution of the diſeaſe; as alſo when the pains in the belly are very ſharp, and grow worſe at certain hours, being followed with a ſanious and purulent diarrhœa, or when plenty of black blood comes away.

It is a bad ſign, when nothing of this happens: but, on the other hand, a heat about the præcordia, a tenſion and pain in the whole region of the ſtomach, a vomiting and hiccup, inquietude, toſſing and trembling of the hands, are very ominous, and ſhew that the inflammation has reached the ſtomach.

The cure is to be performed, 1. By ſpeedily diſcuſſing the inflammatory ſtaſis in the coats of the inteſtines and meſentery, and preventing it from ſpreading farther. 2. By correcting and gently evacuating the matter of the intermitting fever.

The firſt end may be obtained by diaphoretic powders, mixt with a little nitre, in ſmall doſes, but taken often.

Take of ſcorzonera root, 2 ounces; ſhavings of hartſhorn, and paſſular. minor. of each one ounce; of cichory root, half an ounce. Boil the ingredients for half an hour in 8 pounds of water.

To cleanſe the firſt paſſages, and to carry off the morbid matter, uſe a ſolution of manna with cream of tartar, raiſins, and a little ſal polychreſt.

Things of this kind cleanſe the inteſtinal canal, without raiſing a commotion in the blood, without ſtimulating the nervous parts, and without ſinking the ſpirits.

Purges in the beginning are unſafe, becauſe the morbific matter is not prepared; but if the body is coſtive, it may be opened with an emollient and ſapomaceous clyſter.

All deterſive ſalts are improper in this diſeaſe, except ſtibiated nitre and ſal polychreſt.; for theſe have an aperient, diuretic and laxative virtue, and may be given to 15 grains in a proper vehicle. When this fever is on the decline, and nature ſeems intent in carrying off the diſeaſe by ſtool, then the above laxative will be proper.

Bleeding will be proper in the very beginning of the diſeaſe, if the patient is plethoric, the heat urgent, the ſtrength not much impaired, and when ſome critical hæmorrhage is ſuppreſſed. All heating medicines are to be avoided, as well as fixt aſtringent earthy teſtaceous powders; and alſo the bark, unleſs there is a perfect intermiſſion; for this laſt, as Baglivi obſerves, has brought on fatal inflammations, or ſlow hectic fevers.

Of the Nervous Fever.

In a nervous fever, the patients at firſt are ſubject to ſlight tranſient chilneſſes often in a day, with uncertain fluſhings of heat; they have a liſtleſſneſs, laſſitude, and wearineſs; they are apt to ſigh, and complain of a heavineſs, dejection, and anxiety, with a load, pain, or giddineſs of the head, with an inclination to yawn and doze; they want appetite, and diſreliſh every thing; they have a dryneſs of the lips and tongue without any conſiderable thirſt; they have frequent naufea's, with reaching to vomit: the breathing is difficult by intervals, and eſpecially towards night there is an exacerbation of the ſymptoms, with a low, quick, unequal pulſe; the urine is pale, and made often and ſuddenly; a torpor, or obtuſe pain and coldneſs often affect the hind-part of the head, or a heavy pain is felt along the coronary ſuture. Theſe commonly precede ſome degree of a delirium.

The countenance is heavy, pale, and dejected: ſometimes they are quite wakeful; and when they fall aſleep, they are ſo inſenſible of it, that they diſown it.

The pulſe is very remarkable in this diſeaſe, and requires the moſt diligent attention; for it is generally low, quick, and unequal: the inequality conſiſts in this, that a few pulſations ſhall be more ſwift, frequent, and large, ſometimes fluttering; and then preſently it returns to be low and quick.

The urine has generally no ſediment; and when it has, it is like bran; it is ſometimes of a whey-colour, or like dead ſmall-beer. The dryneſs of the tongue ſeldom appears at the beginning, though it is then ſometimes covered with a thin whitiſh mucus; but at the cloſe of the diſeaſe, it often appears very dry, red, and chapped.

About the ſeventh or eighth day the giddineſs, pain, or heavineſs of the head, become much greater, with a conſtant

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ſtant noiſe in it, or tingling of the ears, which is frequently the forerunner of a delirium.

The load on the præcordia, the anxiety and faintneſs, grow much more urgent; and the patient often falls into an actual deliquium, eſpecially if he attempts to ſit up. Now, cold ſweets appear ſuddenly on the forehead and back of the hands, while the cheeks and palms glow with heat, and as ſuddenly go off. If the urine grows more pale and limpid, a delirium is certainly at hand, with univerſal tremors and *ſubſultus tendinum*; the delirium is generally little more than a confuſion of thought and action, a continual muttering and faultering of ſpeech. Sometimes they awake in a hurry and confuſion, and preſently recollect themſelves, but forthwith fall into a muttering, then doze again.

At the ſtate, the tongue grows often dry, with a yellow liſt on each ſide; and when the patient attempts to put it out, it trembles greatly. If at this time a copious ſpitting comes on, it is a very good ſign. When there is a difficulty of ſwallowing or continual gulping, it is a dangerous ſymptom, eſpecially with a hiccup.

On the ninth, tenth, or twelfth day, the patient often falls into profuſe ſweats, which at the extremities are commonly cold and clammy; and frequently there are thin ſtools, which are generally both colliquative and very weakening. A warm moiſture on the ſkin is reckoned ſalutary; and a gentle diarrhœa often carries off the delirium and ſleepineſs.

When the extremities grow cold, the nails livid, the pulſe exceeding weak and quick, inſomuch that it rather trembles and flutters than beats, or creeps ſurpriſingly ſlow, with frequent intermiſſions; then nature ſinks apace, and the patient becomes quite inſenſible and ſtupid; the delirium turns to a profound coma, which ſoon ends in death; or the ſtools, urine, and tears, run off involuntarily, as a prelude to a ſpeedy diſſolution; or there are vaſt tremblings and twitchings of the nerves and tendons, which terminate in a general convulſion, and this in a ceſſation of all motion. One or other of theſe ways cloſes the ſcene, after the patient has languiſhed fourteen, eighteen, or twenty days, nay, ſometimes much longer.

All perſons grow deaf and ſtupid towards the end of the diſeaſe, and if the deafneſs ends in an impoſthume of the ear, or when a *parotis* ſuppurates, or a large puſtular eruption breaks out about the lips and noſe, they are good ſymptoms.

The cure is to be performed with gentle medicines of the cordial and diaphoretic kind, in order to promote perſpiration; by application of bliſters, and by a proper regimen and method of diet. It will bear no other evacuation than moderate cordial diaphoretics, and bliſters; unleſs a gentle emetic ſhould be indicated in the beginning, or a ſmall doſe of rhubarb when it has continued long. Bleeding is very prejudicial, and much ſweating hurtful. In giving diaphoretics, we ſhould always have regard to the urine; for if that, from being pale, gradually heightens to an amber colour, we are right in our doſe, eſpecially if, when in bed, a gentle dew or moiſture comes on without a reſtleſſneſs; and we muſt always remember, that over-ſweating will raiſe the fever, and endanger the patient.

If the patient is inclinable to deliquia or faintings on every little motion, or complains of greater laſſitude or faintneſs than ordinary, it will be neceſſary that he lie in bed and have bliſters applied; if delirious, the bliſters muſt be laid on high on the nape of the neck.

If reſt is wanted, give a few grains of the *flores martiales*; and if a looſeneſs is not feared, the *flores martiales* may be more freely given.

A vomit ruffles nature much leſs than a common purge, and is neceſſary where a nauſea, load, and ſickneſs of the ſtomach, are urgent. If the body is coſtive, clyſters of milk, ſugar, and ſalt, may be injected with ſafety and advantage every ſecond or third day. The temperate cordial and diaphoretic medicines are certainly moſt proper in theſe fevers; a ſupporting, well regulated, diluting diet is neceſſary, and will go a great way in the cure, eſpecially if aſſiſted by well timed bliſters, and keeping the patient quiet in body and mind. Opiates are commonly very pernicious; mild diaphoretics, as *pulv. contrayerv* compoſ. with a little caſtor and ſaffron, and ſmall quantities of *theriac. androm.* or *elixir paregoricum*, will have much better effects. Where the confuſion or dejection of ſpirits are conſiderable, galbanum or ſylphium, with a little camphire, ſhould be added; and bliſters ſhould be forthwith applied to the neck, occiput, and behind the ears: during all this, a free uſe of thin wine-whey, ſome pleaſant ptiſan, with a little ſoft wine, muſt be indulged. A little chicken-broth alſo is of ſervice, both as food and phyſic, eſpecially towards the decline of the diſorder; and for the ſame reaſon, thin jellies of hartſhorn, ſago, and panada, are uſeful, adding a little wine to them, with juice of Seville oranges or lemons.

It was ſaid above, that profuſe ſweats ſhould never be encouraged; yet the patient is never ſo eaſy as while he is in a gentle, eaſy ſweet, for it ſoon removes the exacerbation of the heat, hurry, *&c.* when there are irregular partial heats, with great anxiety, reſtleſſneſs, delirium, difficulty of breathing, and a vaſt load and oppreſſion on the præcordia, ſo as to reſemble a peripneumonic caſe: yet beware of bleeding; for the ſmall, low, quick, and unequal pulſe utterly forbids it, as well as pale, watery, limpid urine.

Here then the nervous cordial medicines are indicated, and bliſters to the thighs, legs, and arms.

Take of the compound powder of contrayerva, 15 grains; of Engliſh ſaffron, 3 grains; a ſcruple of the cardiac confection; and a ſufficient quantity of ſyrup of ſaffron to make a bolus.

When great tremors and *ſubſultus tendinum* come on, inſtead of the *pulvis contrayerva*, a ſcruple of muſk may be uſed.

This bolus ſhould be taken every fifth, ſixth, or eighth hour, and a temperate cordial julep may be given now and then out of thin wine or cyder-whey, or, which in many caſes is better, out of thin muſtard-whey.

But this difficulty of breathing, anxiety, and oppreſſion of the præcordia, often precede a miliary eruption on the ſeventh, ninth, or eleventh day, which ſhould be promoted by ſoft, eaſy cordials, proper diluents, ſometimes with a little *theriaca androm.* or *elixir aſthma.* as tending to calm the uneaſineſs, and to promote a diaphoreſis.

In profuſe, colliquative ſweets, give a little generous

red wine, perhaps a little diluted, which moderates the ſweat, ſupports the patient, and keeps up the miliary papillæ.

Towards the decline of the fever, when the ſweets are copious and weakening, give ſmall doſes of the tincture of the bark, with ſaffron and ſnake-root, interpoſing now and then a doſe of rhubarb, to carry off the putrid colluvies, which makes the intermiſſions or remiſſions more diſtinct and manifeſt.

When there is an evident intermiſſion, give preparations of the bark out of draughts made with ſalt of wormwood and juice of lemon. This method will ſhorten theſe fevers, even with miliary eruptions.

Under any evacuations, diluting nouriſhment is abſolutely neceſſary to keep up the ſpirits and repair the loſs of the juices, and the patient ſhould be frequently prompted to take them. When any diſcharges are very immoderate, they may be prudently reſtrained, but not repelled.

Gilchriſt affirms, that to all the warming, attenuating, ſtimulating, or antiſpaſmodic remedies, cinnabar ſhould be added, and that in no ſmall quantity. And he highly recommends the uſe of the bark in the decline of long nervous fevers, or after a remiſſion. And when there is occaſion for bliſtering he thinks the head moſt preferable whenever it is much affected, though he does not diſapprove the laying bliſters on the back and limbs.

When the low, depreſſing, nervous ſymptoms are ſtronger, the higher methods of ſtimulating are more neceſſary and eaſily borne; in raving, with a low, intermitting pulſe, ſubſultus, fainting, and coldneſs of the extremities, beſides frequent bliſtering, we muſt give camphire and caſtor. The uſes of Virginian ſnake-root, valerian, aſa fætida, myrrh, and terreous abſorbents, are well enough known, and the forms in which they are given. Refreſhing juleps ſhould not be taken by ſpoonfuls, but by draughts. Acrid cataplaſms may be laid to the feet till they begin to ſtimulate or raiſe a juſt degree of heat: then apply poultices of bread, milk, and vinegar, eſpecially during the exacerbation, to allay the heat and ſtruggle; renewing them alternately, in order to keep up a gentle heat and ſtimulus. A quick, hard, and more contracted pulſe, with ſmart heat, toſſing and anxiety, ſhew it is over-done.

Of Epidemic, Catarrhal, Eruptive FEVERS.

THESE fevers are continual, but not violent: they are attended with a proſtration of ſtrength, watching, loſs of appetite, and are ſometimes joined with an eruption of ſpots on the ſkin, ariſing from the plenty and inteſtine diſſolution of an excrementitious ſerum, not without contagion and danger of life.

Theſe fevers were called by the ancients, *continual*, *quotidian*, *ſerous fevers*; and by ſome of the moderns, *malignant catarrhal fevers*, becauſe they are mild at firſt, and attended with a running at the noſe, a catarrh, an infarction of the breaſt, and a cough on the firſt days, with exacerbations at night.

At the beginning of this diſeaſe, the face of the patient has a morbid aſpect, and he is out of order three or four days before he takes to his bed. He complains of a ſpontaneous wearineſs, a grievous pain of his body and joints, as if his bones were bruiſed and broken; his ſtrength is languid, his appetite is loſt, he has a ſlight fainting fit, a cardialgic nauſea, a pain in the head, an unquiet ſleep, with coſtiveneſs. In the evening there is a coldneſs and ſhivering followed by heat, the ſymptoms increaſe, and there is a greater loſs of ſtrength, inſomuch that he can ſcarce ſtand upright. The pain in the head grows worſe, with a giddineſs and inquietude. Some have a violent pain in the back, others in the ſide: they have an anxiety about the præcordia. the internal parts are hot, the fauces dry, the pulſe contracted, quick and weak, the urine is pale without a ſediment, and the breathing difficult.

On the fourth or eleventh day. ſpots appear in ſome, chiefly on the back, breaſt, and arms, with or without relief. Some have more, ſome leſs, of various colours, as purple, a browniſh, livid, or a pale roſe. Theſe are ſometimes broad, ſometimes ſmall; and in many like fleabites. Theſe different ſpots ſerve to diſtinguiſh the fever by ſeveral names, ſuch as miliary, punctcular, baſtard petechial, and the like.

When this diſeaſe is at its ſtate, or vigor, all the ſymptoms are worſe; the inquietude runs very high, as well as the toſſing of the body with unuſual poſtures. The mind is diſturbed, the ſpeech incoherent, ſleep wanting, the ſweat is coldiſh, with a more intenſe difficulty of breathing, and a contracted, unequal, quick and frequent pulſe, as in the nervous fever.

When a ſubſultus tendinum, want of thirſt, rumbling in the belly, hiccup, an inflamation of the fauces from aphthæ, convulſions, a ſyncope, with coldneſs of the extremities, and a moſt plentiful ſweat, ſupervene to theſe ſymptoms, they are certain forerunners of death. On the other hand, when a ſweat breaks out about or on the critical days, that is, the ſeventh, eleventh, or fourteenth day, and continues ſeveral days, though want of ſtrength remains; or if there is a looſeneſs for ſome days, it is a ſign of health: and this the more certain, if the contracted pulſe enlarges, the hard grows ſoft and becomes more equal; if the patient is more chearful, and his lying in bed more ſedate, with a hardneſs of hearing, and a turbid urine depoſiting a ſediment. If this happens about the critical days, it is a certain ſign of a happy event. After this the ſleep, appetite, and ſtrength, gradually return; but this is ſeldom the caſe before the fourteenth day.

Patients of a ſtrong conſtitution, the common people, and ruſtics, with a good regimen alone, generally ſucceed better than the weak, the timorous, the ſad, the thoughtful, the luxurious, the ſlothful, and the ſtudious. All excretions by urine, ſtool, or ſweat, are bad in the beginning, and on other days except the critical. Thoſe that die are carried off by a phrenſy, or an inflammation of the meninges, or of the œſophagus and fauces from aphthæ of the ſtomach itſelf. If blood is taken away in theſe diſeaſes, it is either of a bright red, very fluid and ſerous, or too thick and blackiſh.

In the cure of this diſeaſe, the phyſician ſhould take care not to diſturb the ſalutary excretions, but proceed cautiouſly, and abſtain from ſtrong medicines of every kind, watching and aſſiſting the motions of nature as much as poſſible. The indications are, 1. To reſtrain and prevent.

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vent the entire diſſolution of the blood and humours. 2. To temperate and dilute the ſalino-ſulphureous acrimony of the humours, and at the ſame time to keep the fluids fluxile. 3. To promote gently the excretions by ſtool, urine, the ſkin, and ſpittle. 4. To aſſiſt and reſtore the loſt ſtrength.

To prevent the putrid diſſolution of the humours, direct vinegar, the juices of oranges and lemons, and ſyrups of the ſame; ſpirit of vitriol, ſpirit of ſalt, ſpirit of nitre, eſpecially thoſe that are dulcified.

To abate the acrimony, abſorbent, teſtaceous, and bezoardic powders will be proper To dilute at the ſame time, you may order a decoction of barley with ſcorzonera and ſhavings of hartſhorn; as alſo the ſyrup of orange juice, chicken broth, and the like.

To promote the cuticular excretions, give diaphoretic ſimple waters, alexiterial waters, with the tincture of valerian root, or ſnake root. To aſſiſt the excretions by ſtool, common domeſtic clyſters will be uſeful; or thoſe made of a decoction of barley, oil of ſweet almonds, camomile flowers, elder flowers, ſyrup of violets, common ſalt, or nitre.

Or you may order the following laxative, which muſt be given with caution.

Take 2 ounces of manna, a dram of cream of tartar, 3 ounces of ſcorzonera water, half an ounce of ſyrup of violets, 3 drops of oil of juniper. Mix and make them into a draught.

To raiſe the ſpirits and reſtore the ſtrength, a little wine will not be improper, with hartſhorn jellies, China orange or Seville orange juice with ſugar.

A congruous regimen in theſe diſeaſes is of very great conſequence; for if the patient is kept too hot, the diſſolution of the blood will be promoted, a coſtiveneſs will be induced, the anxiety will be increaſed, the impure ſalt and acrid humours will be actuated, the ſtrength will be exhauſted, the ſweating will be too ſpeedy and profuſe, and ſpots will appear on the ſkin. On the other hand, if cold is incautiouſly admitted, eſpecially to the feet, perſpiration will be checked, the eruptions and ſpots will be driven back: There will be griping pains, a looſeneſs, and the critical evacuations will be diſturbed. All ſudden changes from hot to cold, or cold to hot, are equally bad. A temperate regimen is beſt. However, care ſhould be taken that the patient does not breathe his own atmoſphere full of morbid exhalations, ſo very prejudicial to health; but the air ſhould be drawn out of the room, and freſh admitted.

The perſpiration ſhould conſtantly be kept up, and the linen of any kind ſhould not raſhly be changed, nor ſhould the patient be removed from one bed to another. He ſhould be enjoined not to riſe frequently. And if the bed-cloaths are wet and muſt needs be changed, let them be well-aired, and pretty much worn.

An erect poſture of the head and body is to be ſhunned either in or out of bed, eſpecially if the pulſe is very weak and the ſtrength little; as alſo when the diſeaſe is near the ſtate.

The mind ſhould be kept as chearful as poſſible, and all occaſions ſhunned of exciting anger, fear, terror, or puſillanimity in the patient. His hope of recovery ſhould be kept up as much as poſſible, inſtead of being terrified with the prediction of death.

It is an undoubted axiom, that all ſtrong medicines are hurtful in this diſeaſe; ſuch as emetics, purgatives, and diuretics; as alſo ſudorifics of too ſpirituous a nature: But temperate and moderate things are very uſeful.

It muſt be remembered likewiſe, that theſe fevers have certain types and periods, and exacerbations and remiſſions at certain times; which a phyſician ſhould always carefully obſerve. In the frebile heat, and when the ſymtoms are moſt intenſe, humectants, diluents, and the abſorbent nitrous powders abovementioned will be moſt proper, with a very moderate external regimen. When the pyroxyſm is ended, the ſkin lax, more ſoft, and diſpoſed for excretions; then analeptics, medicines that ſtimulate; and if there is occaſion, bezoardics, and things that promote perſpiration; as alſo the infuſion of veronica, ſcordium, and liquorice, drank as tea, are likely to do the greateſt ſervice. And becauſe a diarrhœa frequently carries off the diſeaſe, it is never to be ſtopt, eſpecially about the critical times, neither with aſtringents, ſedatives or opiates: But if nature tends to this excretion, and is too ſluggiſh, ſhe is to be aſſiſted by the laxative draught above deſcribed, with the addition of tamarinds.

There is no evacuation ſo dangerous as bleeding at the noſe; for then there is a congeſtion of blood in the head from the ſpaſms of the lower parts. However, if the flux of blood is moderate, and the body abounds with it, inſtead of being hurtful, it will relieve the head, though this ſeldom happens. When there are a few drops only without alleviation, they portend a delirium and an inflammation of the fauces: But when the flux is copious, the ſtrength will diminiſh, and the eruptions return inwards not without danger. Therefore, to prevent a conflux of blood to the head, the feet muſt be always kept in a moderate heat and moiſture; mild bliſters ſhould be laid to the calves of the legs, and the body ſhould be opened with clyſters or ſolutions of manna, Theſe will alſo be ſerviceable when the hæmorrhage is too large. But when it is too little, and the eyes look red and wild, with a ſtrong pulſation of the temporal arteries, beſides the former, it will be proper to apply cupping-glaſſes to the nape of the neck, or to thruſt a ſtraw up the noſe to cauſe it to bleed, or to uſe a ſcarifying inſtrument.

Bleeding in theſe fevers muſt be uſed with great circumſpection; for it is much more proper as a preſervative than a cure. But when the diſeaſe has made its onſet with great loſs of ſtrength, complicated with catarrhal diſorders, and when putrid and malignant fevers are riſe, it muſt be always omitted. If the ſtomach has lately been ſurfeited with incongruous aliment, a grain or two of tartar emetic in a ſolution of manna will be neceſſary. Bliſters will be of great uſe when a retroceſſion of the eruptions is apprehended, when the excretions are ſlow, and when there is a ſleepineſs and torpor; in which caſes, they may be laid to the arms and calves of the legs.

Of the Malignant, Goal, *and* Spotted FEVERS.

THE true ſpotted fevers are very malignant, contagious, and detrimental to the head and ſtrength, attended with ſpots of various colours, ariſing from a corruption of

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of the vital fluids, and a putrid diſſolution conſequent thereupon.

Theſe petechial fevers are deſervedly called malignant, or poiſonous, as they generally proceed from a moſt ſubtile, active, virulent vapour, or miaſma, which is infectious. At firſt they often ſeem mild and gentle, and have the appearance of catarrhal fevers; but they ſoon exert their virulent effects in a moſt fatal manner.

At firſt the patient complains of great weakneſs and loſs of ſtrength. and is apt to faint away.

The head aches, and from the very beginning is hot, dull, attended with a dejection of mind. There is conſtant watchfulneſs; the appetite is loſt; the pulſe is languid, ſmall, and unequal; there is an oppreſſion of the breaſt, ſometimes a dry cough, an undulatory and tremulous twitching of the muſcular and tendinous fibres, with a ſubſultus tendinum. Many neither complain of heat, nor pain, nor anxiety, and aſſert that they feel nothing bad, but weakneſs and want of ſleep. The urine is generally thin at firſt, and like that of ſound people. On the fourth, fifth, or the ſeventh day, the ſpots appear principally on the back and loins, of various colours, generally without relief; wherefore they are rather ſymptomatical than critical.

Huxham ſays, theſe fevers attack with much more violence than the flow and nervous; the rigors, if any, are greater, the heats ſharper and more laſting, yet at firſt ſudden, tranſient, and remittent; the pulſe more tenſe or hard, but commonly quick and ſmall, though ſometimes ſlow and ſeemingly regular for a time, and then fluttering and unequal. The head-ach, giddineſs, nauſea, and vomiting, are much more conſiderable, even from the very beginning. Sometimes a ſevere fixed pain is felt in one or both temples, or over one or both eye-brows, frequently in the bottom of the orbit of the eyes. The eyes always appear very full, heavy, yellowiſh, and often a little inflamed. The countenance ſeems bloated, and more dead-coloured than uſual. Commonly the temporal arteries throb much, and a tinnitus aurium is very troubleſome; a ſtrong vibration alſo of the carotid arteries comes on frequently in the advance of the fever, though the pulſe at the wriſt may be ſmall, nay, even low: This is a certain ſign of an impending delirium.

The proſtration of ſpirits, weakneſs, and faintneſs, are often ſurpriſingly great and ſudden; ſometimes, when the pulſe ſeems tolerably ſtrong, the reſpiration is very laborious, and interrupted with a kind of ſighing or ſobbing, and the breath is hot and offenſive.

There is generally a ſort of lumbago, or pain in the back and loins, a wearineſs, ſoreneſs, and pain in the limbs. Sometimes a great heat, load, and pain at the pit of the ſtomach, with a perpetual vomiting of porraceous or black bile, of a naufeous ſmell, with a troubleſome hiccup.

The tongue at the beginning is white, but grows daily more dark and dry, or of a ſhining, livid colour, with a kind of bubble at the top; ſometimes exceeding black for many days: At the height, it is generally dry, ſtiff, and black, and the ſpeech ſcarcely intelligible.

The thirſt, in the increaſe of the fever, is commonly very great, ſometimes unquenchable; and all the drinks ſeem bitter and maukiſh; at other times there is no thirſt, though the mouth and tongue are exceedingly foul and dry; this is a dangerous ſymptom, and ends in a phrenzy or coma. The lips and teeth, near the ſtate, are furred with a very black tenacious ſordes.

At the onſet of the fever, the urine is often crude, pale, and vapid; but grows to ſo high a colour as to reſemble a ſtrong lixivium, or citron urine, tinged with a very ſmall quantity of blood: it has no ſediment, or cloud, for many days together; but by degrees grows darker, like dead ſtrong beer, and ſmells offenſive.

The ſtools, eſpecially near the ſtate, or in the decline of the fever, are for the moſt part very offenſive, green, livid, or black, frequently with ſevere gripes or blood. When they are more yellow or brown, the leſs is the danger: but the danger is greateſt of all when they come away inſenſibly. If the belly be hard, ſwelled, and tenſe, it is a very bad ſymptom. A gentle diarrhœa is often very beneficial, by which nature carries off the morbific matter.

The more florid the ſpots are, the leſs is the danger; and it is a good ſign, if the black or violet become of a brighter colour. The large, black, or livid ſpots, are almoſt always attended with profuſe bleedings. The ſmall duſky, brown ſpots, like freckles, are almoſt as bad as the livid and black. Sometimes they are attended with profuſe, cold, clammy ſweats; at which time the ſpots vaniſh without any advantage.

The eruption of the ſpots is uncertain; ſometimes they appear on the fourth or fifth day; ſometimes not till the eleventh, or later. The *vibices*, or large livid or dark greeniſh marks, ſeldom appear till very near the fatal period. Sometimes about the eleventh or fourteenth day, when the ſweats are profuſe, the ſpots diſappear, and vaſt quantities of ſmall, white, miliary puſtles break out. If there is an itching, ſmarting, red raſh, it commonly greatly relieves the ſick, as well as large, fretting, watery bladders on the back, breaſt, and ſhoulders. A ſcabby eruption about the lips and noſe is a ſalutary ſymptom; the more hot and angry the better. Brown dark aphthæ are more uncertain and dangerous, as well as thoſe exceeding white and thick like lard. They are followed with difficulty of ſwallowing, pain and ulceration of the fauces and œſophagus, with inceſſant hiccup; the whole *primæ viæ* are at length affected, a bloody dyſentery comes on, and a mortification of the inteſtines.

Pringle obſerves, that in hoſpital, goal, or camp fevers, the firſt complaints are gentle horrors, and little feveriſh heats, alternately ſucceeding each other, with loſs of appetite; the diſorder being greateſt at night, the body is hot, the ſleep interrupted and not refreſhing. They have conſtantly ſome pain and confuſion in the head, chiefly about their forehead; the pulſe is at firſt but little quicker than the natural, and the drought, if any, is inconſiderable. They are too ill to mind buſineſs, and too well to be confined. In this ſtate, a change of air, with a vomit and ſweat, will perform a cure; yet a large bleeding at this time will ſink the pulſe, and bring on a delirium.

When the ſymptoms come on quick and violent, the fever ſeems to be inflamatory, and can only be diſtinguiſhed by a knowledge of the circumſtances; and bleeding yields

no

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no relief, but exaſperates the complaints. The aforeſaid ſymptoms are now more high, with great laſſitude, nauſea, and pains in the back, with pain and confuſion in the head, and great dejection of ſpirits.

The pulſe at this time is generally quick and full: now a moderate bleeding affects the pulſe but little; if large, it will ſink, and bring on a delirium. The worſt kind of blood is when the craſſamentum is diſſolved, which is a ſign of high putrefaction.

If the patients lie warm, the body is generally coſtive; if cold, there is a diarrhœa. If they have bilious ſtools when they are warm, they are critical, and not to be checked unleſs immoderate. In the worſt kind of theſe fevers, in the laſt ſtage, a diarrhœa commonly carries the patient off; but then the ſtools are involuntary, colliquative, ichorous, or blackiſh, and of a cadaverous ſmell, which are the effects of a mortification in the bowels.

The heat of the body at firſt is not conſiderable: but if the pulſe is felt for a while, there is an uncommon heat, which remains upon the fingers ſome minutes afterwards. A day or two before death, the extremities feel quite cold, and then the pulſe is hardly to be diſtinguiſhed.

The ſkin is generally dry and parched; yet in the beginning there are often imperfect ſweats, without any relief. A continued and generous ſweat is the ſureſt cure.

The tongue is generally dry, hard and black, with deep chaps; but towards the laſt it is ſoft and moiſt, and the colour is a mixture of green and yellow. The drought is ſometimes great, at other times very little.

Some preſerve their ſenſes through the courſe of the diſeaſe, except a confuſion and ſtupor; but few keep them till death, if it prove fatal. They ſleep ſeldom, and ſeem to be penſive and in deep thought. The face is not ghaſtly nor morbid, till towards the laſt. The confuſion of the head often riſes to a delirium, eſpecially at night, but ſeldom changes to rage. A tremor is more common than a ſubſultus tendinum. The pulſe ſinks all along, the ſtupor or delirium and tremor increaſe, and the ſpirits are relieved in proportion to its riſing to the head. Frequently the patient is dull of hearing from the very beginning, and at laſt grows almoſt deaf.

When the delirium is at its height, the face is commonly flushed, and the eyes red, unleſs after large evacuations; then it appears meagre; the eyelids in ſlumbers are only half ſhut; and the voice, which is conſtantly ſlow and low, ſinks to a degree ſcarce to be heard.

When the fever is protracted with a low pulſe, they have a particular craving for ſomething cordial; and nothing is ſo acceptable as wine. They long for no food; but will take panada, if mixed with wine.

There are ſpots, but not always. In hoſpitals they are leſs uſual at the firſt breaking out of the diſeaſe; but when the air is more corrupted, the ſpots are common. They are of the petechial kind, of an obſcure red, paler than the meaſles, not raiſed above the ſkin, of no regular ſhape, but confluent. Theſe ſpots are very irregular, ſometimes appearing on the fourth or fifth day, and at others on the fourteenth. They are neither critical nor mortal ſigns, but dangerous; if purple, they are more ominous, but not abſolutely mortal. In a few caſes there have been purple ſtreaks and blotches. Theſe ſometimes, as well as the ſpots, do not appear till after death. This fever, on account of its exacerbations at night, may be looked upon as the loweſt degree of the remitting kind.

The duration is uncertain, and in proportion to the virulence. Their courſe is generally from fourteen to twenty days: ſome have died or recovered after four weeks. When the courſe is long, it commonly terminates in abſceſſes of the parotid or axillary glands, ſometimes in an hectic: Some, after this fever is over, fall into an irregular intermittent; many complain of a pain in their limbs, and want of reſt; and almoſt all of great weakneſs, confuſion in their heads, and noiſe in their ears. When the air is highly malignant, the diſeaſe terminates, in five or ſix days, either in death or a critical ſweat.

The moſt peculiar ſymptoms of this diſeaſe, are always a ſingular attack upon the head, as a ſtupor, or pain; and if it lingers, a ſlow low voice, and ſinking of the ſpirits, without any large evacuation; pale urine, petechial ſpots, the bad effects of large bleeding, or too many clyſters; laſtly, the diſagreement of cooling medicines, excepting in the beginning; and on the other hand, the agreement with wine, volatiles, and other cordials, during the greateſt part of the diſeaſe.

As to the prognoſtics, the ſpots are ſo far from being ſalutary, that the more plentiful they are the greater is the degree of the corruption: when they are livid, lead-coloured, and of a greeniſh black, they ſhew a ſphacelous corruption. Thoſe who eſcape are not freed by a cutaneous excretion, but by large ſweats, breathing a ſtinking acor; or by critical fluxes of the belly; which happen by the benefit of nature, when the corruption of the fluids is not great. Many are apt to fall into a ſphacelous corruption of the ſtomach, inteſtines, and other viſcera, or into a phrenſy, or more frequently into an anginous inflammation of the fauces and œſophagus, as appears from the intolerable ſmell which happens after death. This unhappy event is preſaged, if there is no thirſt, or one that is unquenchable; if the tongue is dry, chapt, black; the fauces inflamed and beſet with ſordes, with difficult ſwallowing; if, after the eruption of the ſpots, a difficult breathing and ſtraitneſs of the breaſt remains and gains ground; or if a delirium increaſes after ſweating, and a flux of the belly, the urine being at the ſame time turbid, and depoſiting no ſediments; laſtly, if the eyes are dim, the patient catching at ſtraws; if there is a ſubſultus tendinum, if the excrements come away inſenſibly, or if there is a cold ſweat with convulſions.

Pringle obſerves, that thoſe who are weakened by other diſtempers, or their cures, are more ſuſceptible of the goal or hoſpital fevers than the ſtrong and vigorous; and that one who is recovered is more ſubject to relapſe, than he who is to be firſt attacked.

All the prognoſtics, ſays he, taken ſingly, are uncertain. The following ſigns are good: to have no delirium; to have the pulſe neither very low nor quick, or, if ſunk, to have it riſe by wine or cordials, with an abatement of the delirium; and to have the tongue moiſt, and of a natural colour. It ſeems peculiar to this fever, that deafneſs is generally a good ſign. The natural and beſt criſis is by ſweat, when the pulſe riſes, and the ſymp-

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toms abate; next to that is an inſenſible perſpiration, which is known by the ſoftneſs of the ſkin, moiſture of the tongue, and a remiſſion of the other ſymptoms. Bilious ſtools, with turbid urine, and a moiſt tongue, may be conſidered as ſigns of a favourable criſis. But the contrary of all theſe are bad; as alſo the ſubſultus tendinum, inflamed eyes, and great anxiety. It is obſerved to be among the worſt ſigns, when the patient complains of blindneſs, or when he cannot lie but on his back, and pulls up his knees; or if, when inſenſible, he endeavours to uncover his breaſt, or makes frequent attempts to get out of bed. If there are ichorous, cadaverous, and involuntary ſtools, it is a ſign of certain death.

The formal ratio of theſe pernicious fevers, conſiſts in the putrid diſſolution or colliquation of the blood and vital fluids, eſpecially of that highly elaſtic fine fluid which is contained in the blood, and ſeparated in the brain and ſpinal marrow, by which it is diſtributed by the nerves to all the body, indued with ſenſe and motion, for it greatly vitiates and defiles this liquid. However, ſuch is the nature and power of that poiſonous vapour, by which ſound bodies are infected, that it not only induces a putrid fermentation into the blood and other fluids, but acts immediately on the inward and nervous parts of the brain, which it corrupts, and produces a languor in the vital and animal powers, even while the ſtate of the blood and humours remain free from corruption.

This virulent vapour enters the body by the noſtrils, fauces, and bronchia; whence it immediately reaches the nerves in the brain, and renders the patient light-headed, with a dulneſs of the head, and a loſs of ſtrength, and a vertiginous affection. It likewiſe mixes with the ſaliva, deſcends into the ſtomach, which is a nervous part, and there takes up its principal reſidence: whence the bad ſymptoms generally appear firſt in the ſtomach and præcordia, with a nauſea and an inclination to vomit, as alſo a diarrhœa with gripes, or a coſtiveneſs, with loathing of food, anxiety of the præcordia, and watery eructations from the ſtomach.

Hence the reaſon evidently appears, why nothing is more proper to guard againſt this diſeaſe than turning away one's face from the patient, frequent ſpitting, chewing angelica, zedoary, or pimpernel, and ſmoaking tobacco: hence likewiſe appears, why the force of this poiſon is exerted in the ſtomach, which is beſet with copious crudities, and pituitous and ſalival ſordes; and likewiſe why gentle emetics, joined to alexipharmics, commonly deſtroy the diſeaſe in the bud.

It may be induced by a bad ſtate of the air: for a long moiſt, rainy, cloudy, and ſoutherly ſtate of the air, dulls and depreſſes the motions of the ſolids and fluids neceſſary for life: to this may be added a long and frequent inundation of water, which is apt to generate putrid diſeaſes; as likewiſe the exhalations ariſing from putrid unburied bodies, or from the excrements of animals, eſpecially if confined and ſhut up from the air.

In the regimen, it is neceſſary, if poſſible, to breathe a ſerene, temperately warm air. The room ſhould not be heated too much, it being found to be hurtful. The patient ſhould eat nothing ſolid in the decline of the diſeaſe, nor after it. A free uſe of food, of nouriſhing and comforting broths abounding with oleous particles is pernicious, eſpecially about the critical days, in the ſtate of the diſeaſe, or where there is any critical evacuation. Nothing is more hurtful than an erect ſituation.

Alexipharmics, volatile ſalts, hot and ſpiritous bezoardics, are hurtful, eſpecially with a hot regimen: for they diſſolve the blood, and increaſe the number of ſpots; or cauſe head-achs, inflammations, or copious ſweats.

Bleeding has been good in plethoric bodies, and in thoſe who have been accuſtomed to hæmorrhages; on the contrary, if the patient is low or weak, bleeding is hurtful.

Gentle vomits are uſeful by way of prevention, and in the very beginning of the diſeaſe; but in the progreſs and ſtate have had a bad effect.

Bliſters have been greatly praiſed in the ſtate of the diſeaſe, when there has been a delirium, a ſopor and convulſions, being applied to the neck.

We reject all opiates and ſoporiferous medicines, on account of the pulſe and want of ſtrength; becauſe they retard the excretions, increaſe the maligity, and ſo haſten death.

The medicines uſed are elder-flower water, that of limes, elms, roſes, of the tops of ſcordium, ſcabious, and carduus benedictus; as alſo ſyrups of citrons, pomegranates, and the juice of roſes; powders of mother of pearl, diaphoretic antimony, crabs-eyes, amber, terra ſigillata, burnt hartſhorn, pure nitre. Alexipharmics are, camphire, eſſence and extract of ſcordium, vincetoxicum, the bezoardic ſpirit and tincture, the eſſence or ſpirit of vitriol, and dulcified ſpirit of nitre: Moiſteners, the decoction of ſcorzonera, ſhavings and jelly of hartſhorn: Analeptics, orange-flower water, freſh oil of citrons, with ſugar, confection of alkermes, and balſam of life: Antiſpaſmodics, eſſence of caſtor, cinnabar, and ſuccinated ſpirit of hatſhorn.

In the beginning of the diſeaſe, uſe a bezoardic powder of nitre, and a little camphire, often repeated; in the progreſs and ſtate of it, a mixture of temperate waters, diaphoretics, analeptics, antiſpaſmodics, and cordial bezoardic powders, with a little juice of citrons. In the drink put nitre, or philoſophic ſpirit of vitriol, or ſulphurated clyſſus of antimony, to keep the body open. Alſo give drink of the filtrated decoction of hartſhorn, and root of ſcorzonera, either hot or cold. About the critical day give gentle alexipharmics, with things to promote ſweat when nature ſeems to tend that way.

This is the beſt and ſureſt method of cure. But if the vomiting is too great, with an anxiety of the præcordia, and profuſe diarrhœas, accompanied with gripes, apply outwardly Venice treacle, expreſſed oil of nutmegs, camphire, oil of cloves, and balſam of Peru, mixt together, to the region of the ſtomach. If a diarrhœa exhauſts the patient too much, give a nitrous bezoardic powder, with a little camphire, and theriaca cœleſtis. If the body is coſtive, with gripes, preſcribe lenient clyſters, or ſuch as are made entirely of oil. To raiſe the ſtrength, allow ſpiritous things, ſuch as comfort and are aromatic; but they muſt be externally applied to the pulſes or pit of the ſtomach, or noſtrils. To quench thirſt, give an electuary of Muſcovada ſugar and dulcified ſpirit of nitre.

Nature

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Nature many times ſtrives in vain to diſcharge the irritating matter, by vomit, without the aſſiſtance of art; and therefore ſomething to promote it will render it much eaſier; which may be done by an infuſion or decoction of ipecacuanha, or oxymel ſcilliticum, with a ſlight infuſion of camomile flowers.

The primæ viæ ſhould be unloaded by very gentle methods, ſuch as clyſters of milk, ſugar and ſalt; laxatives of manna, cream of tartar; Glauber's purging ſalt, tamarinds, and rhubarb.

When there are ſigns of redundancy of the bile, it ſhould be forthwith diſcharged by vomit or ſtool, as nature points out; which is often ſucceeded by an amazing change for the better, where an inexpreſſible anxiety, load on the præcordia, perpetual ſickneſs, eructation, and ſingultus, had preceded.

Between the ſeventh and fourteenth day, nature endeavours to relieve herſelf by vomit, or more frequently by looſe ſtools; then given a gentle laxative the eighth and ninth day, unleſs ſome eruption appear, or a kindly ſweat forbid it.

But the conſtant and grand effort of nature, is to throw off the putrid malignancy through the pores of the ſkin. If it be a breathing ſweat at the ſtate of the diſeaſe, and the pulſe grows more open, ſoft, and calm, a little before and during its continuance, it is always ſalutary; but if it be profuſe, cold, clammy, or partial, about the head and breaſt only, the ſign is not good. Profuſe ſweats in the beginning are generally pernicious, eſpecially if a *rigor* ſupervenes.

Sweats ſhould never be forced by violent hot medicines, regimen, *&c.* Plentiful ſubacid diluents will be ſufficient, and gentle cordial diaphoretics.

As acids and ſubaſtringents are given to preſerve the craſis of the blood and tone of the veſſels, and to prevent the farther putrefaction of the humours, diaphoretics, eſpecially camphire, ſhould be joined with them.

Dr Brookes uſed the following preſcription of the bark for many years with ſucceſs, not only in intermittent and ſlow nervous fevers, but alſo in the putrid, peſtilential and petechial, in the decline, though the remiſſions have been very obſcure; but if the patient is coſtive, or hath a tenſe or tumid abdomen, he premiſed a doſe of rhubarb, manna, or the like.

Take two ounces of Peruvian bark in powder, an ounce and a half of orange-ſkin, 3 drams of Virginian ſnake root, 4 ſcruples of Engliſh ſaffron, 2 ſcruples of cochineal, and 20 ounces of ſpirit of wine. Mix and infuſe the ingredients in a cloſe veſſel for three or four days, and then filtrate the infuſion.

Of this give from a dram to half an ounce every fourth, ſixth, or eighth hour, with ten, fifteen, or twenty drops of elixir of vitriol, out of any appropriated draught, or diluted wine. The above compoſition tends to ſtrengthen the ſolids, to prevent the farther diſſolution and corruption of the blood, and in the event to reſtore its craſis.

With this view alſo give a generous red wine, as a moſt noble, natural, ſubaſtringent cordial, which is of high ſervice in the ſtate, but more eſpecially in the decline of theſe fevers, acidulated with the juice of Seville oranges or lemons, as alſo with cinnamon, the rind of Seville oranges, and the like, to which a few drops of elixir of vitriol may be added. Rheniſh and French white wines, when diluted, are alſo a moſt ſalutary drink, and generous cyder is little inferior to either.

Of the Peſtilential Fever.

A peſtilential fever is a moſt acute one, ariſing from a poiſonous miaſma, brought from eaſtern countries; and unleſs it is immediately expelled out of the body, by the ſtrength of the vital motions, by buboes and carbuncles, it is fatal.

It differs from other contagious, malignant, and eruptive fevers, becauſe it is the moſt acute; for it ſometimes kills on the firſt, and ſometimes on the ſecond day. Beſides, in our climate it is not epidemic or ſporadic, from a bad way of living, or unhealthful air; but happens when it is moſt ſalutary, from contagion alone. There is ſomething very ſingular in this infectious miaſma; for though it is apt to ſpread at a ſtrange rate, yet it will abate by intenſe cold, and be plainly extinguiſhed: wherefore in a cold ſeaſon, and very cold countries, it either does not appear at all, or in a very mild degree; whereas if the climate is hot, it is not only moſt vehement, but moſt common.

In this, as in all other contagious diſeaſes, the venomous miaſma is ſwallowed in with the air, and inſinuates itſelf in the ſalival juice, where its tragedy is firſt acted. Whence it aſſaults the head, brain, nerves, and animal ſpirits, producing a torpor in the head, a heavineſs, a ſleepineſs, a violent pain, a ſtupor of the ſenſes, a forgetfulneſs, inquietude, watching, and loſs of ſtrength. From the fauces it proceeds to the ſtomach, creating loathing of food, nauſea, anxiety of the præcordia, a cardialgia, attended with fainting, reaching to vomit, and vomiting itſelf. Hence it proceeds to the membranes of the ſpinal marrow, and the coats of the arteries, producing horrors, a languid, ſmall, contracted, quick pulſe, and even fainting. All theſe are generally ſigns and ſymptoms of the plague; which are of a more violent and quick operation, in proportion to the virulence of the peſtilential miaſma.

All plagues are not of the ſame nature, but vary according to different conſtitutions and circumſtances. Thoſe who have written of the plague univerſally agree, that ſpungy and porous bodies of an obeſe habit, of ſanguine and phlegmatico-ſanguine conſtitutions; women, young perſons, and children; perſons of a timid diſpoſition, that are poor, live hard, or are given to luxury, and ſit up late at nights; are more apt to be afflicted with this diſeaſe, than the ſtrong and intrepid, lean, nervous; thoſe indued with large veſſels; men, or old perſons obnoxious to the hæmorrhoidal flux, and who have iſſues and open ulcers. Nothing brings on this diſtemper more than fear, dread of death, and a conſternation of the mind.

Peſtilential fevers are ſo called, when the patient falls into ſudden weakneſs: for it is a kind of malignant fever, attended with more grievous ſymptoms; the patients die in a ſhort time, that is, in two, three, or four days, and ſometimes ſooner. If malignant fevers ariſe in war-time among

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among the ſoldiers, they are called camp-fevers; in Hungary, an Hungaric fever. But the plague, or peſtilence, is known when buboes and carbuncles ariſe in various parts of the body. The ſweating ſickneſs had its riſe in England, in which the patient fell into a violent ſweat, of which many died in a day's time.

The peſtilential poiſon diſturbs all the functions of the body; for unleſs it be expelled to the external parts, it is certainly fatal. Nor is this to be done as in other fevers, by large ſweats, by ſtools, by a flux of urine, by cuſtomary evacuations of blood, or by bleeding at the noſe, either natural or artificial, for they rather haſten deſtruction. The ſalutary and critical excretion which perfectly ſolves the peſtilential diſeaſe, is by tumours in the ſurface of the body, not otherwiſe than the eryſipelas, between the third and fourth day; and the ſooner the better, for then the ſymptoms are mitigated. The peſtilential tumours are of two kinds; the firſt ariſes in glandulous places, moſt commonly in the groin and arm-pits, ſometimes in the parotid and mammary glands, as alſo the lower maxillary, under the chin, and in thoſe near the aſpera arteria. It is a hard, painful, tenſive ſwelling of the glands, with great heat; and if they are ſalutary, being ſwoln, they grow ſoft, and ſuppurate. The other ſort is the anthrax or carbuncle. Celſus deſcribes it in this manner. It is a ſwelling on which there are puſtules, which riſe but little; they are black, ſometimes ſublivid or pale. In this there ſeems to be a ſanies; it is black underneath. The body itſelf is more dry and harder than uſual. There is as it were a cruſt about it, ſurrounded with an inflammation; nor can the ſkin be raiſed up in the part, but is joined to the fleſh underneath. Mindererus, who was preſent at the plague, ſays, that a carbuncle is of the ſize of a grain of muſtard-ſeed; and about its edge, there is a circle, or burning halo, of a large ſize. The fleſh which it ſeizes is like an eſchar or putrid fleſh, and falls off as if torn out by a wolf. No part of the body is free from theſe carbuncles; but they generally lay hold of the membranes of the muſcles, and the nervous and fibrous ſubſtance of the ſkin, eſpecially in the back, arms, and thighs. At firſt there is an exquiſite itching in the part; which when ſcratched, puſtules ariſe; they are of a red, livid, or whitiſh purple colour, or ſometimes black. When the puſtules are preſſed, they ſeem to be full of pus; under which there is an aſh-coloured cruſt, which being taken away, the fleſh appears corrupted and ſpungy, with intolerable pain and burning of the circumjacent fleſh, which is followed by a mortification of the part.

When the plague is fatal, ſome die of a fainting the firſt or ſecond day. But in many, when the poiſon is not expelled, or, if expelled, returns back, it brings on a mortification of the nervous coats of the noble parts, of the pleura, oeſophagus, ſtomach and inteſtines, or the meninges of the brain; which creeps ſpeedily to all the viſcera, and the blood itſelf; whence the carcaſes ſwell, and have a moſt intolerable ſtench. Sometimes, when the peſtilential tumours are too plentiful, they die of a ſymptomatic fever, from the inflammation, pain, and intolerable heat.

It has been before remarked, that the plague is not a native of our country, but is brought from remote places: whence the beſt preſervative is to fly to a diſtant country; for the ſame reaſon, thoſe princes beſt conſult the welfare of their ſubjects, who in the time of the plague endeavour to prevent the ſpreading of the infection, and, when a family is afflicted, ſeparate the well from the ſick, and burn all their moveables. While this diſeaſe reigns, all perſons ſhould live temperately, avoid an exceſs in the uſe of the non-naturals, and abſtain particularly from violent affections of the mind, and every thing elſe that dejects the ſtrength, diſturbs perſpiration, and generates crudities in the primæ viæ; the mind is eſpecially to be ſupported, and fear, dread, and puſillanimity are to be baniſhed; for more die of terror than of the plague itſelf.

As in the ſmall-pox, the management conſiſts in clearing the *primæ viæ* in the beginning, in regulating the fever, and in promoting the natural diſcharges; ſo in the plague, the ſame indications will take place. In the plague, indeed, the fever is often much more acute; the ſtomach and bowels are ſometimes inflamed, and the eruptions require external applications, which to the puſtules of the ſmall pox are not neceſſary.

When the fever is very acute, a cool regimen is neceſſary; but when the pulſe is languid, and the heat not exceſſive, moderate cordials muſt be uſed. The moſt gentle emetics may be given; the beſt is ipecacuanha, if the ſtomach or bowels are not inflamed, for then certain death muſt be expected.

As for the eruptions, they muſt be brought to a ſuppuration as ſoon as poſſible; and as ſoon as they appear, fix a cupping-glaſs thereon, without ſcarification; and when that is removed, apply a ſuppurating cataplaſm, or plaſter of warm gums.

If the tumors will not ſuppurate, as the carbuncle ſeldom or never does; yet if a thin ichor or matter exſudes through the pores, or if the tumours feel ſoft to the touch, or, laſtly, if it has a black cruſt upon it, then it muſt be opened by inciſion, either according to the length of the tumor, or by a crucial ſection. If there is any part mortified, as is uſual in the carbuncle, it muſt be ſcarified. Then it will be neceſſary to ſtop the bleeding, and dry up the moiſture with an actual cautery, dreſſing the wound afterwards with doſſils and pledgits, ſpread with a common digeſtive.

The next day the wound ought to be well bathed with a fomentation of warm aromatic plants, with ſpirit of wine in it, in order, if poſſible, to make it digeſt, by which the ſloughs will ſeparate. After this, the ulcer may be treated as one from a common abſceſs.

But the patient runs great hazard in this way, notwithſtanding the utmoſt care; therefore artificial diſcharges for the corrupt humours ſhould be attempted. To this purpoſe, large bleeding and profuſe ſweating are recommended to us upon ſome experience.

As for ſweating, as Sydenham adviſes, it muſt be continued without intermiſſion.

If there is a vomiting, the patient ſhould be made to ſweat with the weight of the bedcloaths alone, drawing the ſheet up to his face.

When the ſweat is begun, it ſhould be promoted with ſage poſſet-drink, or ſmall-beer, in which mace has been boiled,

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boiled, repeating them pretty often for twenty-four hours; in the mean while, the ſpirits of the patient are to be kept up with comforting broths. The by-ſtanders ſhould forbear to wipe off the ſweat, nor ſhould the patient change his linen all that time, which is a neceſſary caution; if it be ſtopped before that time, it will be to no manner of purpoſe; during the ſweat, the diarrhœa, if any, and the vomiting, will ſtop of their own accord.

Theriaca, and the like ſolid medicines, being offenſive to the ſtomach, are not the moſt proper ſudorifics. An infuſion of Virginia ſnake root, in boiling water, or, for want of this, of ſome other warm aromatic, with the addition of about a fourth part of aqua theriacalis, is ſafer.

Thoſe who are obliged to be near the ſick, muſt take care that the miaſmata do not approach their vital juices, nor yet the ſalival. To this purpoſe, frequent ſpitting, and waſhing the mouth with vinegar, or wine, or ſnuffing them up the noſe, are uſeful. The efficacy will be ſtill greater, if they are imbued with rue or citron rind. For an acid is the genuine antidote of a putrid and ſulphureous miaſma. Wherefore it is much ſafer to hold acids in the mouth, than alexipharmic roots. It will be likewiſe proper to get a few ſpoonfuls of Rheniſh wine, or bezoardic vinegar, diluted with water or wine, and ſo take them. The Turks deal much in the juice of lemons.

When the plague is actually begun, and the body is coſtive, a gentle clyſter ſhould be uſed. Then a ſweat ſhould be promoted (twenty-four hours at leaſt,) that the poiſon may exhale and paſs through the ſkin; and epithems to the heart will not be without benefit, though they reach only to the right orifice of the ſtomach, and its nervous coats; they may be made of *theriac.* expreſſed oil of nutmegs, camphire, ſaffron, caſtor, and balſam of Peru. But above all, acids are highly praiſed; ſuch as, juice of citrons, Seville oranges, lemons, vinegar, *&c.* which reſiſt poiſon, putrefaction, and prevent the diſſolution of the blood.

When the ſtrength of the diſeaſe is vanquiſhed, gentle laxatives will be proper to expel the ſordes during the courſe of this diſeaſe.

It is worthy obſervation, that few medicines are beſt; for which reaſon people of the lower claſs generally come off better than perſons of diſtinction; and there is nothing worſe than to give alexipharmics abounding with a hot volatile oil; much leſs ought volatile ſpirits to be given, for they fix the poiſon upon the nervous parts. Yet herbs and roots of this kind are not altogether to be condemned, if mixed with acids and nitre. A mixture of *carduus benedictus* water, and wine vinegar, when given to four ſpoonfuls, with a dram of crabs-eyes and theriaca, and repeated, were very uſeful in the plague at Hall in 1682. In the plague likewiſe in Lombardy, 1526, many recovered with the juice of goats-rue, vinegar, water of *carduus benedictus*, and a little *theriac* given to make the patient ſweat: and Thoner obſerves, that nothing was of any advantage in the plague except theriacal vinegar given in the beginning to promote a ſweat. And in the year 1544, when a malignant fever raged among the ſoldiers, a whole regiment was ſaved, to whom this vinegar was given in due time, except a very few. And in the plague at Rome, vinegar with rue, pimpernal root, betony, garlick, and juniper-berries, with a little camphire added to the infuſion, cauſed many to eſcape. Likewiſe the preſervative water of Sylvius has been greatly eſteemed, becauſe of the vinegar. And Minderer asſerts, that unleſs alexiterials be given within twenty-four hours, all medicines are vain.

Of the Miliary Fever.

A miliary fever is not unlike a cattarrhal, and is attended with a more intenſe motion of the vaſcular and nervous ſyſtem, whereby a corrupt lymphatic matter of a peculiar nature is expelled from the inward, and more eſpecially the nervous parts, to the ſurface of the ſkin, in the form of ſmall, rough, miliary puſtules, ſometimes red, and ſometimes white.

Theſe ſmall puſtules are exceeding numerous, cauſing a corrugation, roughneſs, and dryneſs of the ſkin, and have a fetid ſmell peculiar to themſelves. There is no eruption ſo inconſtant as this, for it will ſometimes ſtrike in ſuddenly, and as ſuddenly appear again, and is attended with an itching pricking ſenſation more than any other kind. Other eruptions are common to all countries, and are equally vexatious to men as well as women; but the miliary ſeems familiar and endemic to ſome places only, and more frequently attacks the female ſex, eſpecially in child bed. It is neither epidemic nor contagious: and ſeems rather owing to a fault in the viſcera and fluids, than the intemperature of the air.

The miliary eruptions are either red or white, and are both more or leſs acute, benign or malignant. The red are leſs dangerous, are generally free from a fever, and then are chronical, appearing at ſtated ſeaſons of the year; but ſometimes they are accompanied with an acute fever. The white ſeldom or never appear without a fever, and therefore are more dangerous. In theſe the lympha is affected with a kind of acidity; for the patient diſcharges plenty of ſerum by ſweat, urine, ſtool or ſalivation, which are the effects of an acid which coagulates the thicker part of the blood, and ſeparates the ſerum from it. Beſides, all kinds of acids and refrigerants, not excepting nitre, freely taken, are moſt hurtful in this diſeaſe. On the contrary, abſorbents and anti-acids, and things which render the blood ſpiritous, are moſt ſalutary. Women who eat much fruit, and ſuch like traſh, of the aceſcent kind, and live idle ſedentary lives, are moſt ſubject to this diſeaſe.

Sometimes the miliary eruptions are idiopathic, and ſometimes ſymptomatic, and ſupervene to other fevers, eſpecially the continual, when on the decline. They likewiſe appear very commonly with the meaſles, ſmall-pox, putrid and ſpotted fevers, when drawing towards an end; and then they raiſe a new fever, whoſe attack the debilitated patient is not able to ſtand.

The idiopathic begins with a ſlight ſhivering, ſucceeded with heat and loſs of ſtrength, ſometimes even to fainting. There is a ſtraitneſs about the breaſt, attended with anxiety and deep ſighs, reſtleſſneſs and watching. There is a pricking kind of a heat perceived in the back, with an alternate ſucceſſion of cold, ſhivering, and heat under the ſkin, but moſt ſenſible in the palms of the hands.

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hands. Women in child-bed have the flux of the lochia ſtopped, and the milk recedes from their breaſts. To theſe ſucceeds a roughneſs of the ſkin like that of a gooſe; and a great number of puſtules appear, ſometimes white and ſometimes red, or both together, of the ſize of millet (or muſtard) ſeed. They firſt beſet the neck, then the breaſt and back, and afterwards the arms and hands. When theſe begin to riſe on the ſurface of the ſkin, the more grievous ſymptoms ceaſe. The pulſe, which before was hard, contracted and quick, grows more ſoft, free, and ſlow; the dejection of mind goes off, the ſkin becomes moiſt, and the belly, which was bound ſo much that the patient could not break wind, now ſpontaneouſly admits him to go to ſtool. Afterwards the puſtules ripen, and are full of a ſtinking ichor. The urine appears more ſaturated, and a ſingular fetid ſweat, proper to this diſeaſe, breaks forth; the flux of the lochia in females returns, and within the ſpace of ſeven or eight days the puſtules diſappear, with great itching in the extreme parts, drying up and falling off in ſcales. Then the patient recovers ſtrength, and regains health.

It is hard to determine the day of the eruption of the puſtules; but it is generally the tenth or eleventh day from the beginning, if the fever makes a regular progreſs; ſometimes on the eighteenth, and ſometimes on the twenty-firſt, or twenty-ſecond day.

Bad ſigns are, when the miliary puſtules appear and vaniſh by turns, and the ſymptoms continue violent; but it is worſe if they quite diſappear: Hence an oppreſſion of the breaſt, with ſighs, a ſtraitneſs of the fauces, loſs of ſtrength, and great anxiety.

Fatal ſigns are, when the morbific matter not being thrown out again, there is an inward heat, and the extreme parts are affected with cold and ſhivering, and there is a cold profuſe ſweat; or, on the contrary, when the extreme parts are hot, and a notable ſenſe of coldneſs is perceived in the abdomen, then the patient dies in a fainting fit, ariſing from a mortification of the ſtomach, inteſtines, brain, or womb.

The cure of this fever depends on the following things. 1. To correct and temperate the acrid morbific matter which diſturbs the nervous parts. 2. To relax the ſpaſtic ſtrictures of the nervous fibres proceeding from thence. 3. To evacuate the prepared morbific matter through the pores of the ſkin, and prevent its ſtriking in.

To dilute the ſharpneſs of the humours, and to appeaſe the irritation of the nervous parts, the following decoction may ſerve for common drink.

Take ſhavings of hartſhorn, ſcorzonera root, and ſarſaparilla, of each two ounces; and boil them in 6 pounds of water.

Let the patient be always kept in an equal moderate heat, and abſtain from ſtrong alexipharmics, and things actually hot, becauſe they throw him into too profuſe a ſweat. But when there is an apprehenſion of the puſtules ſtriking in, then the decoction may be drank hot, with moderate expellents, as the exigence requires. Nor ſhould the medicines be too cooling, becauſe they increaſe the anxiety and faintneſs. In the red ſort, when there is an internal heat, with thirſt and a great pulſe, diaphoretics with a little nitre will be proper; even though red and white puſtules appear together. But nitre alone ſhould be uſed with caution, eſpecially when there are ſigns of malignity. No malt liquor ſhould be drank, but the former decoction.

The belly ſhould be neither too much bound nor too open; yet even the gentle laxatives are not to be given till the puſtules begin to dry; and then there is nothing elſe required but an emollient clyſter.

Bleeding ſhould be cautiouſly uſed; for when the weakneſs is exceſſive, the ſweats profuſe, and the pulſe quick, it muſt be omitted. On the contrary, it is neceſſary for childbed women, when the lochia are ſuppreſſed, and the ſymptoms of a miliary fever begin to appear; but then it muſt be done ſpeedily, and the great anxiety, fainting, and difficulty of breathing will ceaſe, and the puſtules break out.

Bliſters on the back are very proper for this diſeaſe; for they help to draw off the impure ſerous humours, and ſtimulate the fatigued nervous fibres to a contraction, ſo as to expel the morbific matter.

Of the Scarlet Fever.

The ſcarlet fever may happen at any ſeaſon of the year, but it appears moſt commonly towards autumn. It reigns chiefly among children. It begins with coldneſs and ſhivering, as in other fevers, without any violent ſickneſs. Afterwards the ſkin is covered with red ſpots, which are larger, more florid, and not ſo uniform as the meaſles. The redneſs remains two or three days, and then diſappears; then the cuticle falls off, and leaves behind it a ſort of meally ſcales, ſcattered over the body, which appear and diſappear two or three times.

Let the patient abſtain from fleſh, all hot cordials, and ſpiritous liquors; let him not go out of doors, nor be confined conſtantly to his bed; and then medicines will be of little uſe.

Apply a bliſtering plaiſter to the neck, and every night give a paregoric of diacodium; and after the fever ceaſes, let the patient be purged with a very gentle cathartic, agreeable to the age and conſtitution.

Of the Measles.

The meaſles are an eruptive catarrhal fever, generally epidemic, which by the increaſed vital motion of the heart and arteries throws on the ſkin an acrid, cauſtic, inflammatory matter, in the form of red ſpots. They begin with chilneſs and ſhivering, and heat and cold ſucceed by turns. The next day the fever comes on with great ſickneſs, thirſt, and loſs of appetite; the tongue is white, but not dry. There is a little cough, a heavineſs of the head and eyes, and a continual ſleepineſs. There is a ſneezing and a ſwelling of the eye-lids, a ſerous humour oft diſtils from the noſe and eyes, which are certain ſigns the eruption is at hand. In the face the ſpots are ſmall; but on the breaſt broad and red, not riſing above the ſurface of the ſkin. The patient often has a looſeneſs, with greeniſh ſtools.

Theſe ſymptoms continue and increaſe till the fourth, ſometimes the fifth day; at which time ſpots like fleabites appear, increaſing in number and magnitude, and in ſome places run together, rendering the face variouſly ſpotted.

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ſpotted. Theſe ſpots conſiſt of very ſmall red pimples, almoſt contiguous, and riſing but little above the ſkin. They may be felt by a gentle touch of the finger, but the riſing cannot eaſily be diſcerned by the naked eye.

From the face the ſpots gradually proceed to the breaſt, belly, thighs, and legs. The ſymptoms do not immediately vaniſh after the eruption, as in the ſmall-pox, except the vomiting. The cough and fever increaſe, with difficulty of breathing. The weakneſs, and a defluxion on the eyes, ſleepineſs, and want of appetite, ſtill continue.

On the ſixth day, and ſometimes ſooner, the ſkin of the face and forehead begins to grow rough; and the cuticle breaking, the puſtules die away; while on the reſt of the body the ſpots are broad and red. On the eighth day the ſpots diſappear in the face, and are ſcarce perceivable elſewhere. On the ninth they quite vaniſh; fine, thin, light ſcales, like flour, falling off from the ſkin at that time.

The meaſles in general are not dangerous, unleſs from an inſalubrious epidemical conſtitution of the year, which ſometimes renders them malignant. This may be known by a ſudden loſs of ſtrength, coldneſs of the extreme parts, great reſtleſſneſs, vomiting, difficulty of ſwallowing, and a delirium. If petechial ſpots or miliary eruptions ſupervene, there is great danger. A continual cough, a looſeneſs, and great inquietude, are bad. Profuſe ſweats are no good ſign. When the diſeaſe is ended, if the cough and hoarſeneſs remain, a conſumption and hectic will follow, without ſpeedy aſſiſtance.

Thoſe who die of the meaſles are generally ſuffocated on the ninth day. Some, when the diſeaſe is ended, have a looſeneſs, which continues ſeveral weeks, and brings on a mortal *tabes*: Some have a ſlow fever, with an atrophy and a ſwelling of the abdomen, which are fatal.

If children are ſuſpected to abound with crudities in *primis viis*, it will be proper to evacuate with half a grain of tartar emetic, and ſyrup of ſuccory with rhubarb. When there are worms, anthelmintics ſhould be given. In adults abounding with blood, phlebotomy is neceſſary on the firſt days. Medicines too hot, and cold nitrous things, are equally hurtful. As ſoon as the eruption is ended a gentle cathartic is proper.

In a cough nothing is better than oil of almonds freſh drawn, mixt with ſyrup of capillaire; half a ſpoonful of which ſhould be given often in water-gruel.

To abſorbent and diaphoretic powders, half a grain of ſaffron may be added.

When this diſeaſe attacks women who are ſubject to hypochondriac or hyſteric ſpaſms, or when the menſtrual flux is at hand, it is often attended with fainting fits, difficulty of breathing, with conſtrictions of the throat, and great anxiety of the præcordia. Therefore the eruptions are not to be driven out with hot remedies, but rather with ſuch things as allay ſpaſms, paregoric and carminative clyſters, ſometimes bleeding, as alſo a little caſtor and nitre mixt with bezoardic powders. By theſe means the ſpots will appear in a ſhort time.

When a diarrhœa happens, it muſt be cautiouſly treated, and not haſtily ſtopt; becauſe it carries off a great deal of filth, and often puts an end to the diſeaſe. Then it will be beſt to waſh the acrimony out of the inteſtines by demulcent clyſters. But if, when the diſeaſe is over, the diarrhœa continues obſtinate, it will be proper to add a few grains of the bark of eleutheria with bezoardic powders.

When there are hæmorrhages, which are generally ſigns of malignity, nothing muſt be uſed that is directly aſtringent, much leſs opiates and anodynes.

If the patient falls into too profuſe a ſweat, ſo that the linen is quite wet, it muſt be changed very cautiouſly for ſuch as is well aired and warm, otherwiſe the ſpots will ſtrike in. Many have been killed in a few hours, by a ſudden change from hot to cold.

When the ſpots are gone, the patients ſhould not expoſe themſelves to the air; but be careful of their diet; otherwiſe they may fall into an aſthma, ſuffocating catarrh, or conſumption.

Sydenham, for the cough, orders the following.

Take an ounce and an half of the pectoral decoction; ſyrup of violets, and true maiden-hair, of each an ounce and a half: make them into an apozem, and take three or four ounces four times a-day.

Let the patient keep his bed for two days after the firſt eruption.

If, after the meaſles diſappear, a difficulty of breathing, fever, and other ſymptoms, ſhould ſupervene, reſembling an inflamation of the lungs, let blood be taken away freely from the arm, once, twice, or three times, as occaſion ſhall require; leaving a due ſpace between each bleeding; and let the pectoral apozem above deſcribed be given, or oil of ſweet almonds alone. About twelve days from the invaſion, let the patient be purged.

Of the Small-Pox.

The ſmall-pox is commonly divided into two kinds; the diſtinct and confluent.

The diſtinct ſort begins with chilneſs and ſhivering, intenſe heat, a violent pain of the head and back, an inclination to vomit: in adults, a great propenſity to ſweat; a pain at the pit of the ſtomach, if it be preſſed with the hand; a dulneſs and drowſineſs, and ſometimes epileptic fits, eſpecially in children; and if the breeding of teeth is over, it is a ſign the ſmall-pox is at hand; for if the fit happens over night, the ſmall pox will appear in the morning, and are, generally ſpeaking, of the favourable ſort.

On the fourth day from the beginning they break out, ſometimes later, ſeldom before, at which time the ſymptoms either abate or wholly diſappear.

The ſpots at firſt are reddiſh, and ſpread themſelves over the face, neck, breaſt, and the whole body. Then there is a pain in the fauces, which increaſes as the puſtules grow turgid.

On the eighth day the ſpaces between the puſtules, which hitherto were white, begin to grow red and ſwell, and to be affected with a tenſive pain. The eye lids are puffed up, and cloſe the eyes; next to the face, the hands begin to ſwell, and the fingers are diſtended; the puſtules of the face, before ſmooth and red, begin to be rough, (the firſt ſign of maturation,) and whitiſh, and throw out a yellowiſh matter, in colour like a honey-comb.

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The inflammation of the face and hands being now at the height, the interſtices between the puſtules are of the colour of damaſk roſes; and the more mild the diſeaſe is, the greater is the likeneſs.

The puſtules about the face, as they ripen, grow more rough and yellow. But on the hands and the other parts of the body, they grow whiter and leſs rough.

On the eleventh day the ſwelling of the face and inflammation diſappear; and the puſtules being ripe, and of the ſize of a large pea, grow dry, and fall off.

On the fourteenth or fifteenth day they vaniſh entirely; except ſome obſtinate puſtules on the hands, which continue a day or two longer, and then break. The reſt come off in branny ſcales, and in the face leave pits behind them.

Through the whole courſe of this diſeaſe the patient's body is either wholly bound, or he goes to ſtool but very ſeldom. Generally thoſe who die of the ſmall-pox, die on the eighth day in the diſtinct, and on the eleventh in the confluent ſort. Then the face, which ought to be turgid, and the interſtices florid, on the contrary is flaccid and whitiſh, at the ſame time that the puſtules are red and elevated, even after the death of the patient. The ſweat, which was injudiciouſly promoted by cordials and a hot regimen, ſuddenly ceaſes; in the mean while the patient is ſeized with a phrenſy, a violent anxiety, a toſſing and ſickneſs; he makes water often and little, and a few hours cloſe the tragical ſcene.

In the confluent ſort there are the ſame ſymptoms, but much more violent. The fever, anxiety, ſickneſs, vomiting, &c. more cruelly torment the patient; yet he does not ſo ſoon fall into a ſweat, as in the diſtinct kind. A looſeneſs ſometimes precedes the eruption, and continues a day or two after it.

On the third day, ſometimes before, ſeldom later, the ſpots appear; and the ſooner, the more will they run together. Sometimes the eruption is retarded till the fourth or fifth day, by ſome terrible ſymptom; ſuch as, a moſt acute pain in the loins, like a fit of the gravel; in the ſide, like a pleuriſy; in the joints, like the rheumatiſm; in the ſtomach, with a ſickneſs and vomiting.

But the ſymptoms do not remit after the eruption, as in the diſtinct ſort; but the fever and other complaints continue to moleſt the patient many days after. Sometimes the ſpots appear like an eryſipelas, ſometimes like the meaſles, but are diſtinguiſhed from them by the time of the eruption. As the diſeaſe increaſes, they do not riſe to any conſiderable height, being intangled with each other in the face; but appear like a red bliſter, and cover all the countenance, which ſwells ſooner than in the diſtinct kind. Afterwards they ſeem not unlike a white pellicle glued to the face, and are not much higher than its ſurface.

The eighth day being paſt, the white pellicle grows daily more rough, and of a duſky colour. The pain of the ſkin becomes more intenſe, and at laſt, in the more cruel kind of this diſeaſe, they do not fall off in broad large ſcales, till after the twentieth day. But this in the mean time is worthy of obſervation, that the more the ripening puſtules are of a browniſh colour, they are the worſe, and the longer in falling off; and the more yellow they are, the leſs they run together, and the ſooner they diſappear.

When the pellicle falls off, there is no roughneſs on the face, but branny ſcales ſoon appear in its room, of a very corroſive nature, which leave deep pits behind them, and ſometimes ugly ſcars; ſometimes the ſhoulders and back are quite deprived of their cuticle.

The danger of the diſeaſe is to be eſtimated from the number and multitude of the puſtules on the face alone. The puſtules of the hands and feet are the greateſt; and the farther they are removed from the extremities, the leſs they are; in adults a ſalivation, and in children a diarrhœa, is a ſign, though not always, of the confluent ſort. The ſpitting ſometimes begins with the eruption, ſometimes two or three days after it; the matter is at firſt thin, but on the eleventh day it is viſcid, and hawked up with difficulty; the patient is thirſty and hoarſe, extremely ſleepy, and his ſenſes exceeding dull; he ſometimes coughs when he is drinking, and the liquor regurgitates through his noſtrils: then the ſalivation generally ceaſes, but the ſwelling of the face ought not to go down quite till a day or two after, when the ſpitting is over; if the hands do not begin to ſwell remarkably, and continue ſo for ſome time, the patient will ſuddenly leave the world.

The diarrhœa does not ſo ſoon attack children as the ſalivation does men. In both ſorts of this diſeaſe the fever predominates from the firſt onſet till the eruption; then it abates till the puſtules are ripe, at which time it terminates.

The day on which the patient is moſt in danger, in the leaſt crude and moſt common ſort of the confluent, is the eleventh from the firſt attack of the diſeaſe; in the more crude, the fourteenth; and in the moſt crude, the ſeventeenth: ſometimes, but very ſeldom, the patient does not die till the twenty-firſt. But in the ſpace of time from the eleventh to the ſeventeenth, as the evening comes on, the patient is daily tormented with a fit of inquietude.

In the management of the patient in the diſtinct ſort, regard ſhould be had to the ſeaſon of the year, and the ſtrength of the patient. Let this be a general rule, to keep the patient in bed during the firſt days of the diſtemper, taking care to defend him from the inclemency of the winter by proper means; and to moderate the exceſſive heat in ſummer by cool air. For the patient ought not to be ſtifled by heat and cloaths, nor ſhould the eruption and perſpiration be checked by cold. However, great care ought to be taken in general to ſupply him with pure and cool air; becauſe a hot air cauſes difficulty of breathing, checks the ſecretion of urine, and increaſes the number of puſtules on the internal organs of the body.

With regard to DIET, it ought to be very ſlender, moiſtening, and cooling; ſuch as oatmeal or barley-gruel; and in the beginning, the beſt regimen is that which keeps the body open, and promotes urine. This end is obtained by boiling preſerved fruits with their food, ſuch as figs, Damaſcene plums, and tamarinds; and by giving them ſubacid liquors for drink; as ſmall-beer acidulated with orange or lemon juice; whey turned with apples, boiled

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boiled in milk; emulſions made with barley-water and almonds; Moſelle, or Rheniſh wine plentifully diluted with water; or any other things of this kind.

In the cure, Sydenham directs bleeding on any of the three firſt days to nine or ten ounces; and then an ounce, or an ounce and a half of emetic wine. But ſome phyſicians will not allow a vomit by any means, unleſs there is a nauſea, and the head is much affected. Yet Hoffman judges it to be proper on the firſt day of the invaſion, and preſcribes two grains of emetic tartar diſſolved in cinnamon water, to adults.

In youths and adults, it is often neceſſary to take away blood two or three times, only with an intermiſſion of two or three days between each time. Blood-letting is ſo far from being an obſtacle to the eruption of the puſtules, if the patient is not too weak, that it forwards it conſiderably.

After BLEEDING, a vomit ſhould be given, if the ſtomach abounds with phlegm or bile, or be loaded with food unſeaſonably taken. Otherwiſe a purge may be preſcribed before the eruption of the puſtules: which may be the infuſion of ſena with manna, or manna alone, eſpecially for children; for no diſturbance is to be raiſed in the body.

To keep the inflammation of the blood within due bounds, and to aſſiſt the expulſion of the morbific matter through the ſkin,

Take half an ounce of bezoar in powder, 2 drams of purified nitre. Mix, and beat into a powder.

Half a dram of this may be taken by an adult three or four times in a day; diminiſhing the quantity for children in proportion to their age.

Sometimes equal parts of theſe ingredients may be preſcribed; and if the effervеſcence of the fever runs very high, a proper quantity of the ſpirit of vitriol may be added to the patient's drink. But if there be any reachings to vomit, they will be removed by draughts containing half an ounce of the juice of lemons, with one ſcruple of the ſalt of wormwood.

When the eruption of the puſtules is compleated, which generally happens on the ſixth day from the attack, let the patient take an ounce of diacodium every evening till the tenth day after the invaſion. On that night, if the ſmall-pox be of the confluent kind, the doſe muſt be increaſed to an ounce and a half; and an ounce in the morning; and ſo an ounce and half every night till the patient is recovered.

Whatever are the ſort, and at whatever time of the diſeaſe a phrenſy ſhall happen, it is to be curbed by paregorics, given one after another till the end is obtained, only waiting to ſee the effect of one doſe before another is ordered.

In the mean time, if the patient is coſtive, which is generally the caſe, and the fever continues, the body is to be opened with a clyſter every ſecond or third day.

If the method is proper in the diſtinct ſmall-pox, it will be found more neceſſary in the confluent, which is attended with greater fear and danger.

In every ſort of this diſeaſe, it is proper to open the body on the decline, that is, on the ninth or tenth day from the eruption, becauſe a putrid fever generally comes on about that time, while the puſtules are drying, or upon the ſubſidence of the ſwelling of the inflamed ſkin, where there is no ſuppuration, which fever cannot be taken off with equal ſafety by any other means; but gentle cathartics alone are to be employed in this caſe, ſuch as were directed before the eruption of the puſtules.

It will alſo be of uſe at this time to take away ſome blood, if the heat be too great, and the patient have ſtrength to bear it.

This putrid fever is by Sydenham called the ſecondary fever, which comes on with heat, inquietude, toſſing, *&c.* and, unleſs prevented, takes off the patient in two or three days. He mentions this fever as coming on the eleventh day, or later; but this is to be underſtood from the time of the invaſion, whereas Mead reckons from the time of the eruption. Sydenham preſcribes large bleeding, and a cathartic two days after, *viz.* one ounce of lenitive electuary diſſolved in 4 ounces of ſimple alexeterial water, together with the free uſe of paregorics.

If the ſpittle through heat is ſo tough that it cannot be hawked up, let a gargle be frequently injected into the throat with a ſyringe. It may be compounded of barley-water and honey of roſes.

When the matter of ſalivation grows very viſcid, and begins to clog the larynx and trachea, the beſt method is to boil marſh-mallows, myrrh, and honey, in a ſufficient quantity of water and vinegar, and to tranſmit the ſteam of the decoction into the patient's mouth, thro' a glaſs or tin tube, of ſuch a ſhape and length as is moſt commodious for a recumbent poſture.

From the eighth day to the end of the diſeaſe, garlick may be applied to the ſoles of the feet; which muſt be renewed every day, eſpecially when the brain is affected.

When the puſtules are perfectly dry and withered, the face may be anointed with a liniment, made of equal parts of oil of ſweet almonds and pomatum, for two days and no longer.

Twenty one days after the invaſion, let a vein be opened in the arm, and the next day give a cathartic, which may be repeated every other day three times more.

This is neceſſary, becauſe no ſpecies of fever requires the body to be thoroughly cleared of the remains of the diſeaſe more than this. After the cathartics, the body is to be reſtored to its former ſtate by a courſe of milk, eſpecially that of aſſes, with ſuitable food, and the air and amuſements of the country.

As there are particular accidents in the ſmall-pox which do not commonly occur, it will be proper to ſay ſomething of them. Sometimes the patient is ſeized with convulſions juſt before the eruption, which is rather a good than a bad ſign in children. In this caſe, blood-letting is carefully to be avoided; but a bliſter is to be applied to the neck, and to the ſoles of the feet. Plaiſters made of equal parts of the cephalic and bliſtering plaiſters; not forgetting to give antiſpaſmodic medicines inwardly. The chief are wild Valerian root, Ruſſian caſtor, and the ſpirits of volatile ſalts chemically extracted from animals.

In adults, the thing is otherwiſe; for they, if not too weak, may loſe a moderate quantity of blood, and then be put into the foregoing method.

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Haller tells us, that camphire aſſiſts greatly in filling the ſmall-pox of the confluent kind with petechiæ; and Monro, that the Peruvian bark does the ſame, that it filled the empty veſicles with matter, changed the watery ſanies into thick white pus, made the petechiæ or ſpots turn gradually to a pale colour, and cauſed the pox to blacken ſooner than was expected. The doſe in powder, is from ten to twenty grains, in ſome rich ſyrup, with an aromatic diſtilled water, every four or five hours. Children may take it in a clyſter, with a ſmall quantity of warm milk, after the bowels are unloaded with a preparatory clyſter. If the clyſter was retained too ſhort a time, ſyrup of poppies was added, or diaſcordium. Theſe injections were repeated morning or evening or oftner. The bark has had good effects in mitigating the ſecondary fever. When the lungs are greatly ſtuffed, it is not to be given.

When the eruption appears without much fear or pain, it is not without danger; for the puſtules frequently do not tend to maturity, and there is no ſuppuration made. Hence the fever increaſes, with inquietude of body, anxiety of mind, difficulty of breathing, and a delirium, which carry off the patient in a few days. In this ſtate, the fever ought rather to be raiſed than checked; and then warm medicines are to be directed which promote ſuppuration, by increaſing the motion of the blood, and thinning the humours, ſuch as Virginia ſnake-root, contrayerva-root, ſaffron, aſſa-fœtida, myrrh, and the like.

But above all, BLISTERS muſt be laid on the limbs.

When the matter of the infection is over abundant, as it happens in bad caſes, nature never fails endeavouring to throw off the load. Thus in adults a ſpitting comes on upon the firſt days of the eruption; whereas chiidren have a looſeneſs almoſt through the whole diſeaſe, which is not to be inconſiderately ſtopped. So in adults, if the ſpitting does not go on to our wiſhes, it ought to be promoted by medicines which ſtimulate the glands of the mouth, eſpecially gargles made of a decoction of muſtard-ſeed and pepper, with the addition of oxymel. For in the confluent and malignant ſmall-pox, if this flux does not ariſe and continue to the end of the diſeaſe, it is a very bad ſign.

The method of abating the rigour of this diſeaſe, and preventing the great mortality with which it was often attended, by inoculation, is now ſo well known and ſo generally practiſed, that a particular detail of it in this place is unneceſſary.

Of the ERYSIPELAS, *or St* ANTHONY'S FIRE.

AN ERYSIPELAS is an eruptive fever, from which no part of the body is exempt; but it chiefly attacks the face. It begins with chilneſs and ſhivering, and other common ſymptoms of a fever. The part affected ſwells a little, with great pain, and intenſe redneſs, and is beſet with a vaſt number of little puſtules; which when the inflammation is increaſed, are converted into ſmall bliſters.

This diſeaſe has great affinity with a peſtilential fever; for it begins ſuddenly, with great ſhaking, heat, loſs of ſtrength, violent pain in the back and head; to which may be added vomiting, and a delirium; but this is to be underſtood of the worſt ſort. On the third or fourth day the malignant matter is thrown out on the ſurface of the body, and then the ſymptoms a little abate. There is often a pain, redneſs, and tumour in the inguinal glands, from whence matter of a hot fiery quality deſcends to the feet. If the head is attacked, the parotid glands are affected; if the breaſts, the axillary. The mammary and axillary glands are not ſeldom ulcerated, and affect the joints with a virulent corruption. And likewiſe, as in the plague, there is nothing more dangerous than the return of the expelled matter back from the ſurface of the body to the inward parts.

In ſome, eſpecially young perſons, the matter is not ſo virulent, nor the fever ſo great; the glands remain unaffected, and the eruption happens on the ſecond day. This is not at all dangerous.

An eryſipelas is either true, or ſimple and ſpurious, which is likewiſe called ſcorbutic. The ſimple only affects the ſurface of the ſkin, and readily yields to proper remedies. But the ſpurious is more chronic, is harder to cure, and often degenerates into malignant ulcers. Beſides, this diſeaſe is ſometimes idiopathic, or a primary diſeaſe; and ſometimes ſymptomatic, or a ſecondary one. For inſtance, in the anaſarca, the aſcites, the yellow and black jaundice, a ſymptomatic eryſipelas ſometimes ſupervenes, and quickly kills the patient.

If it ſeizes the FOOT, the parts contiguous will ſhine; if it be attended with great pain, it will aſcend to the legs, and will not bear to be touched.

If it attacks the FACE, it ſwells and looks red, and there are plenty of watery veſicles. The eyes are cloſed up with the ſwelling; there is a difficulty of breathing; the fauces and noſtrils are very dry, often attended with a numbneſs and drowſineſs: hence an inflammation of the brain is to be feared, or a mortal lethargy.

If it affects the BREASTS, they ſwell, and grow almoſt as hard as a ſtone, with exquiſite pain, and they are very apt to ſuppurate. There is a moſt violent pain in the axillary glands, in which an abſceſs is often formed.

In children the umbilical region generally ſuffers, with a fatal event.

If in a day or two the tumour ſubſides, the heat and pain ceaſe, the roſy colour turns yellow, the cuticle breaks and falls off in ſcales, the danger is over. When the eryſipelas is large, deep, and falls upon a part of exquiſite ſenſe, the patient is not very ſafe. But if the red colour changes into black and blue, it will end in a mortification. If the inflammation cannot be diſcuſſed, it will ſuppurate, and bring on fiſtulas and a gangrene. When the patient is cacochymic, the leg will ſometimes ſwell three times as big as the natural ſize, and is cured with great difficulty. Thoſe who die of this diſeaſe, die of the fever, which is generally attended with difficulty of breathing, ſometimes a delirium, ſometimes with ſleepineſs; and this in ſeven days time.

Let the patient's diet be only water-gruel, or barley-broth, with roaſted apples. If he drinks any beer, let it be very ſmall; and let him keep out of bed ſome hours in a day.

Take away 9 or 10 ounces of blood, and the next morning let the patient take the common purging potion.

It is a conſtant rule among practitioners, in all acute and eruptive fevers, to keep the body in a gentle diaphoreſis.

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reſis. The ſame method is to be obſerved in this diſeaſe.

If the patient is plethoric, addicted to ſpirituous liquors, and more eſpecially if the diſeaſe attack the head, bleeding is neceſſary.

It will be ſafeſt to avoid external applications, unleſs a powder made of elder-flowers and liquorice ſprinkled on the part; or lime water, mixt with a fourth part of ſpirit of wine and camphire, dipping a linen cloth in it ſeveral times doubled, and applying it hot to the part.

An infuſion of ſcordium, elder-flowers, and fennel-ſeed, drank in the manner of tea, is uſeful to expel the morbific matter.

If the diſeaſe does not yield to the firſt bleeding, let it be repeated: if that will not do, let it be reiterated twice more; one day being interpoſed between.

On the days free from bleeding, preſcribe a clyſter of milk and ſyrup of violets.

Some think purges not neceſſary in the beginning of this diſeaſe; but in an eryſipelas of the head, when it affects the brain with a coma and a delirium, either the caſe is deſperate, or cathartics will ſucceed. However, firſt apply bliſters to the neck.

If, after all, the tumor remains, and begins to turn livid; if the pain lies deep, and ſeems to reach the perioſteum, and the part has a tendency to ulcerate; then it will be proper to promote a ſuppuration; at the ſame time endeavouring to ſtop the progreſs of the putrefaction. For this purpoſe the common plaſter will be proper, with a ſufficient quantity of camphire and ſaffron. When there is matter that lies deep, the tumour is to be opened with a lancet, and the pus is to be got out by degrees, not all together.

When the abſceſs is in a glandulous part, and has degenerated into a fiſtulous ulcer, after evacuating the matter, a balſamic liquor is to be injected, made of tincture of St. John's wort, tincture of balſam of peru, choice myrrh, and a few drops of the ſpirit of turpentine.

When there is a mortification coming on, give things inwardly that reſiſt putrefaction, as nitre and a little camphire, [or rather the Peruvian bark.] Outwardly apply a mixture of lime-water, camphorated ſpirit of wine and vinegar with litharge; as alſo tincture of myrrh, [or of myrrh and aloes] made pretty hot, with a linen cloth doubled, and often repeated.

In the ſcorbutic eryſipelas, which continues for ſome time, it will be proper to give gentle laxatives and purifiers of the blood, with diaphoretics. After the body has been opened for ſome days, give diuretics and diaphoretics alternately for a conſiderable time; and for common drink, order a temperate decoction of mucilaginous woods and roots with bitters; particularly ſuccory roots, dandelion-roots, and raiſins.

Of the SYNOCHUS, *or Continual* FEVER *without remiſſion.*

THIS fever, by ſome called SYNOCHA, by others a CONTINUAL FEVER, is an acute ſanguineous fever, becauſe it is raiſed by a congeſtion of the blood, chiefly in the nervoſo-membranous parts; which, unleſs timely diſcuſſed by the benefit of nature and art, produces a fatal inflammation.

It begins, in ſome, with a mild ſenſe of cold, and is ſoon attended with very grievous ſymptoms, continuing without remiſſion till the critical time, with a great and full pulſe. If the blood is forced to the head, for it always affects one part more than another, the face will ſwell, the eyes will be red and full of tears; there is a pain in the head, with a pulſation of the temporal arteries, a vertigo, a ſleepineſs, torpor, or a raving. When the blood ruſhes impetuouſly into the ventricles of the heart and pulmonary veſſels, cauſing a diſtention therein; then the breathing will be thick and difficult, with a ſtraitneſs of the breaſt, as alſo an anxiety and palpitation of the heart, attended with a loſs of ſtrength, and a dejection of the mind. A ſlight inflammation of the œſophagus, with a ſpaſtic ſtricture of the glands of the fauces, will cauſe thirſt, dryneſs and blackneſs of the tongue. If the inflammatory congeſtion happens in the ſtomach, it will create a nauſea, a reaching to vomit, and ſometimes a hiccup. If in the inteſtines, there will be inflations grievouſly exaſperating the diſeaſe, together with a coſtiveneſs, or an ejection of fetid excrements. If in the veſſels proceeding from the meſaraic arteries and vena portæ, there will be a fixed pain at the firſt vertebra of the loins: if in the membranes of the ſpinal marrow, the patient will tumble and toſs and lie irregularly in bed, and will have a torpor and languor of the limbs, ſometimes attended with convulſions.

But all theſe ſymptoms never happen to all, nor is their violence conſtantly alike. Some diſtinguiſh this fever into the ſimple and putrid. The firſt is cauſed by a congeſtion of good blood in improper places. But when it attacks perſons full of impure juices, who have been weakened by a preceding diſeaſe, conſtant anguiſh of the mind, exceſſive coition, or inordinate living, the ſymptoms are much more grievous, with loſs of ſtrength, and the diſeaſe will continue till the fourteenth or the twenty-firſt day, ſometimes with eruptions, duſky or black ſpots, with immediate danger.

If the cauſe is not violent, this diſeaſe will often diſappear, merely by the benefit of nature, on the fourth, ſeventh, or eleventh days, with a large ſweat or bleeding at the noſe, and, though very ſeldom, by a flux of the belly, unleſs it has ſomething of malignity.

When the diſeaſe is rightly managed in the beginning, that is on the firſt, ſecond, and third day, with bleeding and cooling things, and gentle diaphoretics, it will end on the fourth. But if the bleeding is omitted, or is too little, it may continue till the fourteenth or ſeventeenth day, with the more grievous ſymptoms, as alſo a delirium: but it will terminate at laſt by a ſweat or looſeneſs.

When it proves fatal, the patient generally dies of a ſphacelous inflammation of the brain, or other parts, as the ſtomach or inteſtines.

The intentions of cure are, 1. To free the vital parts from too great a congeſtion of blood, which will either diſperſe a ſlight inflamation, or prevent a great one. 2. To appeaſe the exæſtuation of the blood and the ſpaſtic affection of the ſyſtem of the nerves. 3. To diſcuſs the ſtagnating and corrupted fluids, and to reſtore a free circulation of the blood, chiefly to the ſurface of the body.

To anſwer the firſt intention, the patient muſt loſe blood

blood freely. Then the orgaſm of the blood muſt be appeaſed with diluents, acids, and nitrous compoſitions. And certainly if any diſeaſe requires acids, and the juice of tart fruits, it is this, ſuch as tamarinds, and the juices of currants, oranges, and lemons.

Take two pounds of water; roſe-water, white ſugar, and juice of oranges, of each one ounce.

The jelly of hartſhorn made pretty thin, with the addition of orange-juice, ſugar, and roſe-water, will make a proper demulcent and cooling drink; or whey turned with juice of lemons or oranges.

To direct the motion of the blood to the ſurface of the body, gentle diaphoretics will be proper, ſuch as the bezoardic or abſorbent powders, ſometimes alone, and ſometimes with citron juice. Likewiſe infuſions of the leaves of *veronica*, *ſcordium*, or *carduus benedictus*, with fennel-ſeed, drank in the manner of tea, eſpecially to promote ſweating on the fourth day, when the diſeaſe is like to terminate with this ſalutary excretion.

It will be neceſſary, whether this fever be ſimple or putrid, to keep the body open; for which purpoſe a clyſter made of whey, honey, oil of ſweet almonds, with a little nitre and ſalt, will be proper; for by this means the ſtricture of the inteſtinal fibres will be relaxed, and flatus's will be diſcharged, which diſtend the colon. In the decline of the diſeaſe, when there are apparent ſigns of coction in the urine, a laxative of manna and cream of tartar, or caſſia and rhubarb, will be of great uſe.

Of the Bilious Fever.

The bilious is a kind of a burning fever. It begins with intenſe heat, thirſt, anguiſh, and inquietude. There is likewiſe a vomiting, or a perpetual reaching to vomit, with frequent bilious ſtools, a coldneſs of the extremities, internal heat, and cardialgic anxiety. This fever is either acute, or very acute. In this the ſymptoms are more violent, the bilious purging upwards and downwards is very plentiful, joined to a *cardialgia* with fainting. It generally kills before the ſeventh day, with an inflammation of the ſtomach and duodenum; the ſigns of which are, a fixed igneous heat about the *præcordia*, with a coldneſs of the extremities, high inquietude and anxiety, a hiccup, and a plentiful eructation of bile and ſalival liquor, a jaundice-colour of the countenance, and a hippocratic face.

Some are not ſo acute, but run a greater length, with now and then a remiſſion, and perhaps an intermiſſion, and have an exacerbation, with vomiting, anxiety, and coldneſs every other day, or every third day, and ought to be called continual quotidians or tertians.

It is cauſed by a bilious fluid ſecreted plentifully in the liver, and poured out into the ſtomach and duodenum, where by its acrimony and corroſiveneſs it ſtimulates the nervous tunics, corroding and inflaming them; whence the ſymptoms proper to this fever ariſe, ſuch as a burning heat, a cardialgic anxiety, a nauſea, a reaching to vomit, and a violent purging upwards and downwards.

Hoffman, in the cure of the bilious fevers mentioned by him, would have the cauſtic acrimony of the bilious juices abated and ſheathed by abſorbent powders and nitre, which ſhould be taken in a ſufficient quantity of a liquid, and often repeated. He likewiſe recommends emulſions of almonds, of the cold ſeeds; elder-flower water, roſe-water, *&c.* as alſo jellies of hartſhorn, milk and water, oil of ſweet almonds, ſweet whey, chicken broth.

After theſe things, medicines muſt be given to reſtrain the impetuous bilious excretions, and to abate the too quick ſyſtaltic and periſtaltic motion of the biliary ducts, and to prevent the too great excretion of the bile.

In the cure of the Bilious Fever of the camp, Pringle, before it becomes continual, depends on the proper uſe of evacuations, the neutral ſalts, and the bark. Bleeding is the firſt thing to be done in every caſe, and is to be repeated once or oftener, according to the urgency of the diſtemper. The vernal and later autumnal remittents are accompanied with rheumatic, pleuritic pains, and other ſymptoms of high inflammation, which require more bleedings than the intermediate ſeaſon. To omit this, and give the bark too ſoon, will bring on an inflammatory fever A vein may be opened ſafely either during the remiſſion, or in the height of the paroxyſm.

After bleeding, give an emetic in the remiſſion or intermiſſion of the fever, and rather ſoon after a paroxyſm than before one. But emetics do harm when the ſtomach is inflamed, or when the diſeaſe has continued ſome time, and has aſſumed the type of a continual fever. However, we may ſafely give one when the fever intermits, or has conſiderable remiſſions. Ipecacuanha is ſafeſt, but antimonials moſt efficacious. If the remiſſions are ſmall, or the fever great, or there is a tendency to vomit, the former is beſt. But when the remiſſions are diſtinct, or the remiſſion perfect, the latter ſhould be preferred; or it may be joined to the former; that is, two grains of tartar emetic, with a ſcruple of the powder of ipecacuanha. Thoſe vomits are beſt which produce ſtools, eſpecially if they procure a plentiful diſcharge of corrupted bile upwards or downwards.

If the body continues coſtive, a laxative will be proper, eſpecially if there is a teneſmus, or pains in the bowels. The ſaline draught, with ſalt of wormwood and lemon-juice, will bring the fever ſooner to regular intermiſſions.

Whenever the ſweats are not profuſe enough in proportion to the fits, the quantity of an ounce of *ſpir. Mindereri* may be given, divided into two or three draughts, before they go off. It promotes a plentiful diaphoreſis, without heating.

As the fevers are never without an inflammation in the beginning, and then rarely have complete paroxyſms, the bark is not to be given till the urine breaks, and there are entire ſhort intermiſſions; nor yet before bleeding, as was obſerved above; nor before the firſt paſſages have been cleanſed; otherwiſe the fever will return, or a tympanites will be produced.

It is beſt to give the bark in ſubſtance in Rheniſh wine; or an ounce of it may be made into an electuary, with ſyrup of lemons, and a dram of ſal ammoniacum. If the patient has not been purged, it will be proper to add as much rhubarb as will keep the body open for the firſt two or three days of uſing that medicine, It is chiefly uſeful when the bilous humonrs abound, as they moſtly do in marſhy countries. If the paroxyſms are quotidian, and the

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the intermiſſions ſhort, it may be neceſſary to give the bark before the ſweating is quite over.

If the diſeaſe has been neglected in the firſt ſtages, or if after the remiſſions or intermiſſions it changes to a continual fever, with a full and hard pulſe, a vein muſt be opened. But if there is a pain in the head, or a delirium, and the pulſe ſmall, it will be beſt to apply leeches to the temples. But whether the patient is bled or not, bliſters are the beſt remedy. If the *primæ viæ* are loaded, clyſters or a laxative may be proper; but neither vomits nor purges; nor are thoſe to be repeated without caution. To theſe remedies the ſaline draught may be added.

Sweating is the proper criſis: it is never to be promoted by theriaca or volatiles; but when the pulſe ſinks, and petechiæ, or other ſymptoms appear, it will be proper to uſe the warmer alexipharmics, and to treat the diſeaſe like a malignant fever.

A looſeneſs is the leaſt favourable criſis: yet if there are colic pains, or a tenſion of the belly, attended with dryneſs of the ſkin, it will be proper to procure ſtools by a clyſter, or a gentle laxative, ſuch as the infuſion of rhubarb with manna; which is to be repeated as the patient can bear it.

Of a Causus, *or* Burning Fever.

The principal ſymptoms of a cauſus are, a heat almoſt burning to the touch, moſt remarkable about the vital parts, but more moderate towards the extremities, which are even ſometimes cold: the breath is extremely hot; there is a dryneſs of the whole ſkin, noſtrils, mouth, and tongue. The reſpiration is thick, difficult, and quick; the tongue is dry, yellow, black, parched, and rough; the thirſt is unquenchable; there is loathing of food, a naufea and vomiting; an anxiety, inquietude, and great laſſitude; a little cough, a ſhrill voice, a delirium, a phrenſy, a continual watching or a coma, convulſions, and on the odd days an exacerbation of the fever.

In this temperate climate theſe ſort of fevers are very rare; thoſe that are more common among us are the burning ſanguineous, or the continual bilious fevers without remiſſion.

This begins without any remarkable coldneſs or ſhivering, with great heat, thirſt, watching, anxiety and inquietude. In ſanguineo-bilious conſtitutions, and in bodies full of hot bilious blood, they terminate in critical days in health or death, being firſt preceded with a ſhaking. They terminate in a ſalutary manner, with a ſweat or a bleeding at the noſe.

On the third and fourth day it often proves mortal; it ſeldom exceeds the ſeventh, if violent.

It is often terminated by an hæmorrhage; which if ſmall on the third and fourth day, it is a fatal ſign. It is beſt if it happens on a critical day.

A ſolution of this fever on a critical day, may alſo be by vomiting, ſtool, ſweat, urine, or ſpitting thick phlegm. If the exacerbation of this diſeaſe happens on the ſecond or fourth day, it is a bad ſign; on the ſixth, not ſo bad.

The urine black, ſmall in quantity, and thin, is fatal; ſo is ſpitting or piſſing of blood. A difficulty of ſwallowing is a bad ſign; but the worſt of all is coldneſs of the extreme parts. The face red and ſweaty, is bad; a parotis not tending to ſuppuration is fatal; the body too looſe is fatal. A tremor turning into a delirium is mortal: it often changes into a peripneumony with a delirium. When this diſeaſe ſucceeds gripings of the bowels, it is worſt of all.

A critical determination of this fever is uſually preceded by a rigor, or ſhaking.

The Cure of a burning fever is moſt eaſily obtained in a pure, cool air, frequently renewed: The patient muſt not be oppreſſed or ſtifled with bed-cloaths, but ſhould ſit up often. He ſhould drink plentifully of ſoft, ſub acid, aqueous, and warm liquors. His diet ſhould be light, made of pearl barley, oatmeal, and ſub-acid fruits.

Bleeding is neceſſary at the beginning, if there is a plethora, or ſigns of a particular inflammation, or the heat is intolerable, or the rarefaction too great, or a revulſion neceſſary, or the ſymptoms urgent, in which circumſtances the diſorder is hardly to be vanquiſhed by any other remedies.

Soft, diluting, laxative, antiphlogiſtic cooling clyſters, are to be repeated as oft as the heat, coſtiveneſs, and revulſion require them.

The whole body is to be moiſtened by receiving into the noſtrils the ſteams of warm water; by waſhing the mouth, throat, feet, and hands, with the ſame; by fomenting with warm ſponges the places where the veſſels are moſt numerous, and moſt expoſed to the touch.

The medicines ſhould be aqueous, ſoft, nitrous, gratefully acid, gently laxative, not promoting ſweat and urine by their acrimony, but by their plenty; ſuch as remove the contraction of the fibres, reſolve the thickneſs of the humours and dilute, and temper their acrimony.

To appeaſe thirſt in this diſeaſe, and to moiſten the tongue and parched fauces, there is nothing better than ſweet whey, in a quart of which half a dram of pure nitre has been diſſolved. Small draughts of this, a little cool, may be drank frequently, which will likewiſe extinguiſh the pernatural heat. The mouth and throat may alſo be waſhed with water, mixt with ſyrup of mulberries and nitre.

Purgatives are dangerous before the criſis, but clyſters may be uſed, made of milk, honey, and a little nitre. After the criſis, which is known by the ſediment in the urine, laxatives made with tamarinds, manna, rhubarb, raiſins, or cream of tartar, are abſolutely neceſſary

Of the Burning Bilious Fever, *or* Yellow Fever *of the* Weſt Indies.

The yellow fever begins with a momentary chilneſs and ſhivering, which is ſoon ſucceeded by a burning heat all over the body, but is felt more intenſely about the præcordia. The pulſe is high, ſtrong, and rapid; the eyes are heavy; with a throbbing pain in the head, and a violent beating of the temporal arteries, and a thick, laborious reſpiration: There is a naufeouſneſs, and reaching to vomit; and when any thing is thrown up, it is of the bilious kind: Beſides theſe, great anxiety, pain in the back and loins, and an uneaſy laſſitude in all the limbs.

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About twelve hours after the invaſion, the tongue is dry, harſh, rough, and diſcoloured, with inſatiable thirſt; there is a foreneſs all over the body, great reſtleſſneſs, and a delirium.

In the laſt ſtage the patient labours under a great coma, oppreſſion of the præcordia, heaving of the lungs, an interrupted reſpiration, tremblings of the tendons, convulſions, and cold clammy ſweats.

It uſually terminates in a favourable criſis, or the death of the patient, about the fourth day after the attack.

The regular criſis generally diſcovers itſelf by a ſuffuſion of the bile all over the ſurface of the body about the third day. The ſaffron tincture is frequently diſcovered in the eyes twelve hours after the invaſion: the ſooner it appears, the more favourable is the prognoſtick.

If the jaundice comes on too ſoon, it is bad; if with livid ſpots, which ſometimes, though rarely, appear, it is fatal. If the ſkin continues obſtinately dry and rough, the caſe is dangerous; and the more ſo, the longer it continues; for theſe very ſeldom recover, be the pulſe ever ſo good. The pulſe is not to be depended on; for many have a good pulſe a few hours before death. If the vomitings are inceſſant, grow darker, and the hiccup comes on, it is generally fatal. If the face is greatly flushed, and the veſſels of the white of the eye are turgid with blood, as in an ophthalmia attended with a phrenzy, the patient is likely to die in a very little time, eſpecially if the ſkin is dry.

But if the head continues clear, the pulſe becomes ſoft, the pains, nauſea, and anguiſh are relieved by bleeding; as alſo if the humours vomited up are carried downwards by laxatives; if then the inquietude ceaſes, the ſkin grows ſoft and moiſt, and the patient has better ſpirits; it is probable he will recover.

Bleeding is the firſt thing to be done, more or leſs, according to the force of the diſeaſe and the ſtrength of the patient; and, if the ſymptoms continue in their full vigour, ſhould be repeated once in ſix or eight hours, leſſening the quantity proportionably each time.

After the firſt bleeding, give a vomit of ipecacuanha, quickened with three or four grains of emetic tartar, (or rather two grains,) which will bring up a great quantity of yellow, porraceous, and ſometimes blackiſh bile, and carry the humours downwards.

After this the patient may drink plentifully of diluting, refrigerating, and ſubacid liquors, made with oranges, lemons, tamarinds, ſpirit of ſulphur, ſpirit of vitriol, and ſuch like, in barley-water, ſpring-water, or other thin and cooling vehicles. He may likewiſe be allowed tartiſh juicy fruits; as ananas, granadilloes, Barbadoes cherries, and water-melons; as alſo plantains, and bananaes, roaſted for food, jelly of guavaes, *&c.*

Cooling teſtaceous powders are likewiſe very beneficial.

Towards the evening it will be neceſſary to inject a clyſter, made of the common decoction, with half an ounce of cream of tartar, an ounce of manna, or an ounce of pulp of caſſia added to it.

When the operation of the clyſter is over, paregorics will be proper, as thus:

Take 2 ounces of mint-water, one ounce of cinnamon water, 25 drops of the tinctura thebaica, and a ſufficient quantity of ſugar.

The room ſhould be kept cool, and ſprinkled with vinegar, roſe-water, and cooling herbs. Freſh air ſhould be admitted, but not to blow directly on the patient's body.

Bliſters are alſo of great efficacy at this juncture; which if applied before it be too late, a coma, the deadly ſymptom of this diſtemper, very rarely enſues.

The patient's diet ſhould be nothing but thin panada and water gruel, gratefully ſweetened and acidulated.

Beſides plentiful and frequent draughts of cooling liquor, the patient ſhould be allowed preſerved tamarinds, ſlices of lemon with a little ſugar; but above all, penguins, which by their ſharpneſs penetrate the thick tenacious ſcurf, whereby the glands of the mouth will be unloaded. Opiates muſt alſo be uſed in larger doſes than in Europe.

Cooling and lenient clyſters muſt alſo be repeated every eight hours.

When the patient begins to be comatoſe, the third and laſt ſtage of the diſeaſe is advancing; in which are, difficulty of breathing, oppreſſion of the *præcordia*, convulſive twitching of the tendons, interruption of the pulſe, and at length its total ceſſation.

In this caſe, a compleat ſet of bliſters muſt be immediately applied, or the old ones renewed; which muſt be laid to the nape of the neck, on the wriſts, thighs, and legs, and a large one on the crown of the head. To the ſoles of the feet may be laid a cataplaſm of ſalt-herrings and muſtard.

With regard to the urgent ſymptoms; pains of the head, watchfulneſs, and deliria, are to be relieved by emollient and laxative clyſters, gentle purgatives, cupping with ſcarification, opening the frontal vein, lotions of the feet, and narcotics.

Bliſters are alſo uſeful for the ſame purpoſe.

Convulſions require much the ſame treatment externally; and internally, *aurum muſivum*, (the doſe from four grains to a ſcruple.) To reſtore the ſtrength of the patient, little more is required than a ſtomach purge or two, mild and agreeable bitters, and a reſtorative regimen of broths, jellies, and white meats.

If the yellow tincture remains upon the ſkin, give a vomit of ipecac. and a purge or two with the decoction of ſenna, tamarinds, *&c.* and allow the uſe of lemons, oranges, and other acid fruits. If this diſorder proves obſtinate, treat it as the jaundice.

Of the Senegal Fever.

The fever which chiefly prevails in this country in the months of July, Auguſt, and September, is of the worſt kind. It uſually begins with drowſineſs, laſſitude, and great rigors, which continue frequently three or four hours, and are ſucceeded by intenſe heat and ſweats. For three or four days it remits, and both the ſhiverings and hot fits become more moderate. During this period, the pulſe is quick and low; but afterwards becomes fuller, unleſs ſome evacuation intervene. At this time profuſe ſweats are eaſily brought on; in which caſe there are little hopes of recovery. A parched, dry ſkin, is as bad a ſymptom, if it continues more than a day; for an intermitting

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intermitting pulſe and a delirium ſucceed, and continue for ſeven or eight days, the frequency of the intermiſſions increaſing every day: but if a general moderate moiſture comes one at this, or any other time of the diſorder, and continues, the patient recovers. A violent pain in the head and back, and difficulty of breathing, are general complaints. Sudden languors, and bilious vomitings, are frequent through a great part of the time.

Some are taken with a great heat, and a ſtrong quick pulſe, without any ſhiverings or remiſſions, as abovementioned. In this caſe the patient ſooner dies upon the appearance of bad ſymptoms, and is longer in recovering upon the appearance of good ones.

The loſs of eight or ten ounces of blood, in the firſt attack of theſe fevers, has ſunk the pulſe beyond a poſſibility of raiſing it afterwards, and that even in plethoric habits, attended with great pains of the head. It is, indeed, ſurpriſing how little theſe fevers will bear of evacuations of any kind, eſpecially bleeding.

After profuſe ſweats, the pulſe becomes extremely ſlow; and, though the ſweating goes off, continues ſo for two or three days, with anxiety and reſtleſſneſs; after which the pulſe grows quick, the ſkin parched and hot, and a ſeries of bad ſymptoms comes on.

The ſick are always comatoſe and ſtupid; which ſymptom is little dangerous when attended with a warm moiſture on the ſkin, but otherwiſe it is generally fatal.

It is of great conſequence to keep up the pulſe; but here the common cordial medicines are ineffectual; yet the decoction of the bark, with the camphorated julep, and ſpirit of vitriol, anſwers this purpoſe effectually, ſo as to render any other medicine unneceſſary, except occaſionally a gentle emetic or laxative.

Of the Inflammation *of the* Stomach.

The inflammation of the ſtomach is known by a burning, fixed and pungent pain in the ſtomach, which is exaſperated at the inſtant any thing is taken into it; and is ſucceeded by a moſt painful vomiting and hiccup. There is always a violent internal heat, high anxiety, and a grievous pain about the præcordia, chiefly at the pit of the ſtomach, an acute, continual fever, great thirſt, difficult breathing, inquietude, toſſing of the body, coldneſs of the extreme parts, a hard, contracted, quick, and ſometimes unequal pulſe.

It may be diſtinguiſhed from other diſorders of the ſtomach; for in the cardialgia, there is alſo a great anxiety about the præcordia, a preſſing acute pain reaching to the back, a coldneſs of the extremities, a conſtant ſtimulus to vomiting, with inquietude: But the heat in the region of the ſtomach is not ſo violent, nor is the thirſt and dryneſs of the tongue ſo great, nor the pulſe ſo quick and contracted, and the ſtomach can better bear and retain any thing taken inwardly; nay, is frequently relieved thereby. An inflammation of the inteſtines has a pain or gripes more about the region of the navel, with frequent, frothy, bilious ſtools, or a little bloody, with a heat over all the ſurface of the body, and a quick large pulſe: Whereas in this diſeaſe the extremities are cold.

If it be cauſed by drinking cold liquors when the body is hot; or from an effuſion of the bile after violent commotions of the mind; the danger is not very great, as there will be room for ſuitable medicines to take effect: But that which ariſes from draſtic purges, ſharp emetics, or cauſtic poiſons, kills quickly without ſpeedy aſſiſtance. This diſeaſe likewiſe often proves fatal to the old, the infirm, the ſcorbutic, and perſons full of grief, as alſo in the end of acute diſeaſes.

When there is a reſtleſs toſſing of the body; when liquids are immediately thrown up; when there is a hiccup, a fainting, an hippocratic face, an intermitting pulſe, and convulſions, a fatal mortification will ſoon terminate the patient's life.

This diſeaſe, if not ſuddenly cured, is generally mortal: And therefore, as ſoon as it is diſcovered, plentiful bleeding is neceſſary, and muſt be repeated as the violence of the ſymptoms increaſes. Let the drink be very ſoft, antiphlogiſtic, and emollient; as alſo clyſters of the ſame kind.

The patient ſhould totally abſtain from every thing that is acrimonious; even the cooling, nitrous ſalts, which are beneficial in other inflammations, irritate too much. Vomits, cordials, and ſpirituous liquors, are little better than poiſon.

Aliments ſhould be given frequently, and by a ſpoonful at a time; for any diſtention increaſes the inflammation. A thin gruel of barley, oatmeal, whey, with very little ſugar or honey, or chicken-broth, are proper aliments; whey-emulſions, barley-water, emollient decoctions, are proper drinks.

The indications of cure are, 1. To open the obſtructions cauſed by tenacious juices impacted into incongruous veſſels; 2. To remove the ſpaſtic ſtrictures which contract the veſſels, and to reſtore the equable and natural progreſs of the blood through the ſubſtance of the ſtomach. Theſe ends are to be obtained by *diluents*, *humectants*, *demulcents*, *antiſpaſmodics*, and things that reſtrain the heat which thickens the fluids, and relax the conſtricted fibres.

But as there are more cauſes than one that produce an inflammation, they will require different remedies to bring about a cure.

Therefore, if it be owing to a cauſtic, ſeptic, arſenical poiſon, or a ſtrong emetic or cathartic, or to metallic medicines ill prepared, and thence the inflammation; oily fat things are proper, as new milk, cream, oil of ſweet almonds, or olive-oil taken often and plentifully.

If from a ſpaſm, ſucceeding a violent commotion of the mind, then a nitrous abſorbent powder will be proper, in an emulſion of white poppy ſeeds. When the ſpaſm is appeaſed, rhubarb with raiſins will be neceſſary to carry off the bilious ſordes.

When an eruptive matter is repelled and cauſes this diſeaſe, uſe emulſions of the greater cold ſeeds, with temperate bezoardic powder; now and then adding a little nitre and a ſmall matter of camphire.

If from a cauſtic bile, as in the cholera morbus, an inflammation is apprehended, earthy abſorbents and harts-horn philoſophically prepared ſhould be given, with gelatinous decoctions of calves and neats feet, or hartſhorn-

jellies

jellies and water-gruel. Outwardly, the following liniment is uſeful in all caſes:

Take of oil of ſweet almonds 2 ounces, and a dram of camphor; mix and make them into a liniment, to be applied warm to the ſtomach.

Of the QUINSEY.

A QUINSEY is an inflammation of the fauces, with a burning pain, tumor and redneſs; a difficulty of breathing or ſwallowing; and a fever, proceeding from a ſtaſis of blood, or a viſcid acrid ſerum in the ſanguineous or lymphatic veſſels.

It begins with a fever, which is followed with a pain and inflammation of the fauces, cauſing the uvula, tonſils, and larynx to ſwell; whence great difficulty of breathing and ſwallowing enſues.

This diſeaſe may be ſeated at the root of the tongue near the *os hyoides*; the *foramina* of the noſtrils opening to the bone; the beginning of the *œſophagus*; the muſcles of the pharynx; the internal and external muſcles of the larynx; the greater and leſſer glands; the tonſils, or the muſcles moving the jaws.

When a quinſey affects the internal muſcles of the larynx, and there is no outward redneſs about any part of the neck, but a burning pain inwardly, a loſs of voice, and great difficulty of breathing; it often kills in twenty-four hours. This is called a *kynanche*. When it is ſeated in the internal muſcles of the pharynx, it is called a *ſynanche*; in which there is no external tumor and redneſs, but a great difficulty of ſwallowing and breathing, and whatever is drank returns through the noſe. When there is an outward tumor and redneſs, and the external muſcles of the pharynx are affected, it is a *parafynanche*; when the external muſcles of the larynx, a *parakynanche*.

A quinſey is likewiſe diſtinguiſhed into the true and ſpurious. The true ariſes from the ſtaſis of the blood; the ſpurious or baſtard from a congeſtion of the ſerum. The former is acute, always attended with a rigor and a fever. The latter has rather a lymphatic or catarrhal, than an acute fever. The firſt has not only a burning, pricking pain in the inner parts of the fauces, but the tongue is turgid with blood, and of a dark reddiſh colour; the face is likewiſe red; there is a great pulſation of the temporal arteries; ſometimes a head-ach, a torpor of the ſenſes; ſometimes fainting.

When it is very violent, there is a difficulty of breathing, high anxiety, and coldneſs of the extremities; and is very dangerous, requiring ſpeedy help. But in the ſpurious, thoſe ſymptoms are either abſent, or more mild; nor is the danger ſo great.

This diſeaſe may be cauſed by a ſuppreſſion of ſome uſual ſanguineous evacuation; by admitting the cold air after a ſtrong ſudorific has been taken; and by lying in rooms new plaiſtered or white-waſhed. Some cauſtic poiſons affect the throat more than other parts. White hellebore attacks the fauces, and brings on a ſtrangulation. The ſame enſues from the *ſolanum furioſum*, and the bite of a mad dog. The fumes of arſenical and mercurial miſnerals, as alſo the vapours of mineral ſpirits, will have the ſame effects.

It ſometimes comes on ſpontaneouſly, and is again the ſymptom of another diſeaſe, as the diarrhœa and dyſentery, eſpecially if the flux is haſtily ſtopped. It has happened from the ſtriking in of an eryſipelas; or ſometimes from the gout being injudiciouſly treated with topicks; as alſo from the ſmall-pox, or a malignant or peſtilential fever. The cauſe of the ſymptomatic diſeaſe is coſtiveneſs, or ſuppreſſed perſpiration, or the ſtriking in of eruptions. When it is epidemic, it has ſomething of malignity.

When the ſwelling, pain, and redneſs, appear more outwardly, and vaniſh by degrees, it is a ſign of a happy ſolution of the diſeaſe. But when the external ſwelling ſuddenly diſappears, without a mitigation of the ſymptoms, it ſhews the morbific matter to be tranſlated elſewhere, and will change to a phrenzy or peripneumony. Or this diſeaſe may terminate in a ſuppuration or gangrene, or a ſchirrus. A frothing at the mouth, the tongue vaſtly ſwelled, and of a purple, blackiſh colour, portend death.

In theſe inflammations a ſlight diarrhœa relieves: Therefore aliments which promote it are uſeful, as tamarinds infuſed in whey; decoctions of farinaceous vegetables moderately acidulated, and ſuch as abound with a cooling nitrous ſalt, are proper. Burnet is ſaid to be a ſpecific in this caſe. Mulberries are beneficial, and all acids.

The mouth and throat muſt be kept moiſt, and the noſe clear, that the air may have clear paſſage through it. When the patient cannot ſwallow, he may be nouriſhed by clyſters.

Take away blood plentifully from the arm, and afterwards open a ſublingual vein; but bleeding in the jugular yields the beſt aſſiſtance, and is much more ſafe. If the ſymptoms continue to be very urgent, the bleeding may be repeated in ſix or eight hours time, till they begin to be more mild.

After the firſt bleeding, lay a ſtrong and large bliſter on the fore-part of the neck, or a piece of flannel dipt in the volatile liniment.

Then let the parts inflamed be touched with the following mixture:

1. Take a ſufficient quantity of honey of roſes and ſpirit of ſulphur. Mix them.

Then the following gargle is to be uſed, held in the mouth till it is hot before it be ſpit out; which is to be repeated pretty often:

2. Take a pound of barley-water, 8 ounces of honey, and 2 drams of ſpirit of ſal armoniac. Mix them.

Emollient ſteams, or even the ſteam of hot water taken in at the mouth, are beneficial.

If the patient is not able to ſwallow any nouriſhment,

3. Take ten ounces of beaf-tea, 10 grains of nitre, and 6 drops of ſpirit of ſalt. Mix and make them into a clyſter.

Let it be injected every eighth hour, after the belly has been cleanſed with a purging clyſter.

If the tumour tends to a ſuppuration, it is beſt promoted by holding fat, dried figs in the mouth; and when the tonſils are full of an inflammatory ichor, honey of roſes mixt with ſpirit of vitriol, and often applied to the part with a pencil, is excellent.

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That inflammatory pain which ariſes from a ſharp ſalt ſerum in the glandulous parts of the fauces, with redneſs, and a copious flux of ſaliva, but without a fever, may be cured with a gargle of brandy alone. An inflammation of the fauces is ſometimes cured with ten drops of camphorated ſpirit of wine, in which a grain of nitre has been diſſolved, and ſuffered to paſs ſlowly down the throat.

The acute and inflammatory quinſey may be defined, "An inflammation of ſome part or parts, either within or "contiguous to the throat, rendering deglutition painful, "or impracticable; and, when it is of the moſt dangerous "kind, likewiſe affecting reſpiration."

When only ſwallowing is impaired, the parts inflamed may be the tonſils, the velum palati, and uvula, the muſcles of the pharoynx, and thoſe of the larynx, which raiſe it or pull it down in deglutition, but whoſe action is not concerned in moderating the aperture of the glottis; while the larynx itſelf and the aſpera arteria remain free.

But when the reſpiration is pinched, beſides other parts, theſe muſcles, which are employed in opening and ſhutting the glottis, muſt be inflamed; and likewiſe, probably the inner membrane of the larynx, and thoſe muſcles and fibres that join the rings of the aſpera arteria together: And ſometimes theſe minute and remote parts are affected without any redneſs or tumour, either within the fauces, or outwardly on the throat: This kind of quinſey is the moſt dangerous and ſuddenly deſtructive of all.

The practitioner in every kind of quinſey ought to look carefully into the mouth and fauces, in order to diſcern where any redneſs and tumour is; that by comparing the appearance of the parts with the functions impaired, he may be enabled to form the better judgment with reſpect to the ſeat of the diſeaſe, the prognoſtic, and method of cure.

If the breathing is remarkably affected, there is abſolute neceſſity of applying all the moſt efficacious remedies with the greateſt briſkneſs and ſpeed poſſible. Theſe are plentiful and repeated bleedings, a large bliſter between the ſcapulæ; fomentations and cataplaſms outwardly; ſteams to be received into the throat, the beſt ingredient in which is vinegar; ſmart, but cooling purges; or, if theſe cannot be got down, clyſters of the ſame kind; bathing the feet and legs in warm water, and even ſemicupia not made too hot, for fear of raiſing the pulſe too high.

But even though the reſpiration ſhould not be affected at firſt, if the ſymptoms are otherwiſe violent, remedies ought to be ſmartly and quickly applied to prevent ſuppuration. For when the inflamed part tends to ſuppuration, the tumour keeps increaſing: and when the pus is actually formed, the bulk may be ſo enlarged as to endanger ſuffocation, or the patient may be ſtarved by a total privation of ſwallowing; ſo that ſuppuration ſhould always be prevented, if poſſible.

If in the courſe of the diſtemper the patient ſhould run a riſk of being ſuffocated, the operation of bronchotomy becomes neceſſary. See SURGERY.

Of the Malignant QUINSEY, *or* Putrid SORE THROAT.

THIS diſeaſe generally comes on with ſuch a giddineſs of the head, as often precedes fainting, with a chilneſs or ſhivering like that of an ague fit, followed by great heat; and theſe alternately ſucceed each other for ſome hours, till at length the heat becomes conſtant and intenſe. The patient then complains of an acute pain in the head, of heat and foreneſs, rather than pain, in the throat; ſtiffneſs of the neck; commonly great ſickneſs, vomiting or purging, or both. The face ſoon after looks red and ſwelled, the eyes inflamed and watery, as in the meaſles; with reſtleſſneſs, anxiety, and faintneſs.

It frequently ſeizes the patient in the fore-part of the day; and as night approaches the heat and reſtleſſneſs increaſe, continuing till towards morning; when after a ſhort, diſturbed ſlumber, the only repoſe during ſeveral nights, a ſweat breaks out, which mitigates the heat and reſtleſſneſs, and gives the diſeaſe ſometimes the appearance of an intermittent.

If the mouth and throat be examined ſoon after the firſt attack, the uvula and tonſils will appear ſwelled; and theſe parts together with the velum pendulum palati, as well as the cheeks on each ſide, near the entrance into the fauces, aud as much of the fauces and the pharynx behind as can be ſeen, appear of a florid red colour. This colour is commonly moſt obſervable on the poſterior edge of the palate, in the angles above the tonſils, and upon the tonſils themſelves. Inſtead of this redneſs, a broad patch, or ſpot, of an irregular figure, and of a pale white colour, ſurrounded with a florid red, is ſometimes to be ſeen. This whiteneſs is commonly like that of the gums after having been preſſed with the finger; or as if a matter ready to be diſcharged lay underneath.

Generally on the ſecond day, the face, neck, breaſt, and hands, are of a deep eryſipelatous colour, with a ſenſible tumefaction. The fingers are ſo frequently tinged in a remarkable manner, that it has been no hard matter to gueſs at the diſeaſe from a bare ſight of them.

A great number of ſmall pimples of a more intenſe colour than that which ſurrounds them, appear on the arms and other parts. Where the redneſs is leaſt intenſe, they are larger and more prominent, which is generally on the arms, breaſt, and lower extremites.

As the ſkin becomes red, the ſickneſs commonly goes off, and the vomiting and purging ceaſe.

The appearance in the fauces continues the ſame, only the white place becomes of a more opake white, and is diſcovered to be a ſlough, concealing an ulcer of the ſame dimenſions. Theſe ulcerations are generally firſt diſcernible in the angles above the tonſils, or on the tonſils themſelves. They are alſo often ſeen in the arch formed by the uvula and one of the tonſils; on the pharynx behind, on the inſide of the cheeks, the baſis of the tongue, which they cover like a thick fur. Where the diſorder is mild, there is only a ſuperficial ulcer, of an irregular figure, in one or more of thoſe parts, ſcarce to be diſtinguiſhed from the ſound part, but by the inequality of its ſurface. Likewiſe the redneſs and eruption do not always appear, and in ſome not till the third, fourth, or fifth day, or later.

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The parotid glands on each ſide commonly ſwell, grow hard, and are painful to the touch; If the diſeaſe is violent, the neck and throat are ſurrounded with a large œdematous tumour, ſometimes extending itſelf to the breaſt, and by ſtraitening the fauces increaſe the danger.

Towards night the heat and reſtleſſneſs increaſe, and a delirium frequently comes on. This happens to ſome on the firſt night. It is very remarkable, that the patient commonly returns a proper anſwer to any queſtion, but with unuſual quickneſs; yet when they are alone, they generally talk to themſelves incoherently. However, at the firſt tendency to this diſorder, they affect too great a compoſure. This for the moſt part happens to thoſe that ſleep but little; for ſome are comatoſe and ſtupid, and take but little notice of any thing that paſſes.

They continue thus for three, four, or more days, commonly growing hot and reſtleſs towards the evening. Theſe ſymptoms and the delirium increaſe as the night comes on: a ſweat, more or leſs profuſe, breaks out towards morning; and from this time they are eaſier during ſome hours, with a faintneſs, which is their chief complaint.

Some grow eaſier from the firſt day of the attack; others have ſymptoms of recovery on the third, fourth, or fifth day. Firſt the redneſs of the ſkin diſappears; the heat grows leſs; the pulſe, hitherto very quick, becomes ſlower; the external ſwellings of the neck ſubſide; the ſloughs in the fauces are caſt off; the ulcerations fill up; the patient ſleeps without confuſion, is compoſed when awake, and his appetite begins to return towards more ſolid nouriſhment.

The pulſe, during the courſe of this diſeaſe, is very quick, beating frequently 120 times in a minute. In ſome it is hard and ſmall, in others ſoft and full, but not ſo ſtrong and firm as in genuine inflammatory diſorders.

If a vein be opened ſoon after the diſtemper comes on, the blood generally appears of a freſh and florid red; the *craſſamentum* is rather of a lax, gelatinous contexture, then denſe or compact; the ſerum is yellow and in a large proportion.

The urine is at firſt crude and of a pale whey colour; as the diſeaſe advances it turns yellower, as if bile was diluted in it; and ſoon after any ſigns of recovery appear, it commonly grows turbid, and depoſites a farinaceous ſediment.

They ſeldom have any ſtools if the ſymptoms are favourable, from the time the purging, which generally attends the acceſſion, ceaſes. This diſcharge is remarkably bilious, yet without pain.

The thirſt is commonly leſs than in other acute diſeaſes; and the tongue generally moiſt, but not furred. Some have it covered with a thick white coat, and complain of ſoreneſs about the root of the tongue.

Though the uvula and tonſils are ſometimes ſo much ſwelled as to leave a very narrow entrance into the gullet; and this entrance frequently ſurrounded with ulcers, or ſloughs; yet the patient ſwallows with leſs difficulty and pain than might be expected. Soon after they are taken ill, they frequently complain of an offenſive putrid ſmell, which often occaſions ſickneſs before any ulcerations appear. The inſide of the noſtrils, in thoſe that have this diſeaſe ſevere, frequently appears, as high as can be ſeen, of a deep red or almoſt livid colour. After a day or two, a thin corroſive ſanies, or with it a white putrid matter, of a thicker conſiſtence, flows from it, ſo acrid as to excoriate the part it lies upon any conſiderable time. This is moſt obſervable in children, or in young and very tender ſubjects; whoſe lips are likewiſe frequently of a deep red, or almoſt livid colour, and covered on the inſide with veſicles containing a thin ichor, which excoriates the angles of the mouth and cheeks where it touches them

This acrid matter ſeems to paſs with the nouriſhment into the ſtomach, eſpecially of children; for if they get over the diſeaſe, a purging ſucceeds, yet attended with ſymptoms of ulcerations in the bowels: theſe, after great pain and miſery, at length die emaciated.

The patients ſometimes bleed at the noſe towards the beginning of the diſeaſe; and the menſes often appear in the female ſex, if they are of age, ſoon after they are ſeized, though at a diſtance from the time of their regular period. It brings this evacuation upon ſome that never had it before. This flux, in full ſtrong habits, is ſeldom attended either with benefit or with manifeſt ill effects, unleſs very copious; yet ſometimes it occaſions great faintneſs, and an increaſe of the other ſymptoms. Hæmorrhages of the noſe and mouth have carried the patient off ſuddenly: but this does not happen till ſeveral days after the attack; and perhaps may be owing to the ſeparation of a ſlough from the branch of an artery.

Children and young perſons are more expoſed to this diſeaſe than adults; girls more than boys; women more than men; and the infirm of either ſex than the healthy and vigorous. Very few grown people have it. When it breaks out in a family, all the children are commonly infected with it, if the healthy are not kept apart from the ſick. And ſuch adults as are frequently with them, and receive their breath near at hand, often undergo the ſame diſeaſes.

With regard to the cure, bleeding is generally prejudicial. Some admit of it at the firſt attack without any ſenſible inconvenience; but a repetition of it in the mildeſt caſes ſeldom fails to aggravate the ſymptoms; it has ſometimes produced very fatal conſequences. It increaſes the heat, reſtleſſneſs, delirium, and difficulty of breathing; nor do the ſwelling of the fauces, tonſils, *&c.* receive any benefit therefrom. On the contrary, though the fullneſs of theſe parts decreaſes, yet the ſloughs thicken and change to a livid black colour, the external tumour grows large, and the ſpitting commonly diminiſhes. Indeed, the heat and quickneſs of the pulſe may ſeem to abate at firſt by this evacuation; but they commonly return with greater violence, the patient is ſeized with a difficulty of breathing, falls into cold ſweats, a ſtupor, and dies ſuddenly.

Nor is purging more beneficial; even gentle cathartics have brought on very dangerous ſymptoms. Upon procuring a few ſtools with manna, eſpecially when the diſeaſe has continued two or three days, the redneſs of the ſkin has diſappeared, and the flux to the throat has been ſurpriſingly increaſed. If this diſcharge by ſtool continues,

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tinues, the ſwelling of the neck commonly grows larger, the fauces become flaccid, dry and livid; and the patient a few hours after this expires.

Nitrous cooling medicines frequently produce the like effects; they increaſe the faintneſs which accompanies this diſeaſe, and either diſpoſe the patient to copious ſinking ſweats, or ſtools.

Upon the whole, it appears, that all evacuations which tend to leſſen the natural ſtrength of the conſtitution, are injurious; and thoſe perſons are commonly in the greateſt danger who have been previouſly indiſpoſed, or their ſtrength impaired by grief.

If the purging, therefore, continues long after the firſt exacerbation of the diſeaſe, it is a dangerous ſymptom; for though it may ſometimes be reſtrained for the preſent with opiates or aſtringents, yet it commonly returns with greater vehemence when their efficacy ceaſes, and in a ſhort time exhauſts the ſmall degree of ſtrength remaining. In this caſe they generally ſweat very little; the fauces appear dry, gloſſy, and livid; the external tumour grows large; they void their excrements without perceiving it, and fall into profuſe ſweats; the reſpiration becomes difficult and laborious, the pulſe ſinks, the extreme parts grow cold, and death, in a few hours, cloſes the ſcene. The eye loſes its luſtre, and becomes opaque and dim, ſometimes ſeveral hours before death.

A copious flux of pituitous matter to the glands and other parts about the fauces, have ſeemed ſometimes to be the cauſe of ſudden death.

It is neceſſary that the patient ſhould be kept in bed as much as may be, though the diſeaſe ſhould ſeem to be ſlight; for a purging has come on for want of care in this reſpect, the redneſs of the ſkin diſappeared, and a diſorder which with confinement alone would probably have gone off in twice twenty-four hours, has been rendered tedious and difficult.

At the firſt, while the ſickneſs and vomiting continue, it will be beſt to promote the diſcharge, by giving an infuſion of green tea, camomile flowers, carduus, or a few grains of ipecacuanha.

If the ſymptoms do not abate by this means, give ſmall draughts of mint-tea, with a ſixth part of red port, frequently, together with ſome warm and cordial aromatic medicine, every four or ſix hours.

The diarrhœa, as well as vomiting, generally ceaſes in leſs than twelve hours from the firſt attack: If it continues longer, it is neceſſary to check it; otherwiſe it occaſions great faintneſs, ſinks the ſtrength, and in the end produces dangerous conſequences. The aromatic cordials commonly take off this ſymptom, if given plentifully, and the vomiting likewiſe.

Patients generally complain of an exceſſive faintneſs ſoon after they are taken ill. The urgency of this ſymptom ſeems to indicate the degree of danger; and an abatement of it is a pretty ſure preſage of recovery. Aromatic medicines are likewiſe found uſeful in removing this ſymptom. Wine may be given in ſmall quantities in whey, or mint, baum, or ſage-tea, barley-water, gruel, panada, ſago, and the like; for it is not only an antiſeptic, but a generous cordial. When the faintneſs is exceſſive, it may be given alone.

Bliſters likewiſe relieve faintings; they may be applied with advantage to the uſual parts, and to the neck on each ſide, from below the ear almoſt to the clavicle, as occaſion requires.

With regard to the ulcers, which demand our early and conſtant attention: When the diſeaſe is of the mildeſt kind, only ſuperficial ulceration is obſervable, which may eſcape the notice of a perſon unacquainted with it. A thin, pale, white ſlough ſeems to accompany the next degree; a thick, opake, aſh-coloured one is a farther advance; and, if the parts have a livid or black aſpect, the caſe is ſtill worſe. Theſe ſloughs are real mortifications of the ſubſtance; ſince, whenever they come off, they leave an ulcer of a greater or leſſer depth, as the ſloughs are ſuperficial or penetrating,

The thin, acrid ichor, which is diſcharged from under the ſloughs, often proves of bad conſequence, eſpecially to children. If gargles are injected, they either prevent them from reaching the ſeat of the diſorder with their tongues, or they ſwallow them and the putrid taint of the ulcers together; whence fatal purgings enſue, or fatal hæmorrhages from the penetrating gangrene. Thoſe that have a plentiful diſcharge from the fauces, carrying off this ichor, are ſeldom attended with ſickneſs, vomiting, or exceſſive faintneſs; and where there is little or no diſcharge, the ſymptoms are commonly moſt dangerous.

Hence the great advantage of gentle ſtimulating aromatic gargles appears; becauſe they promote the diſcharge of pituitous matter, and, doubtleſs, ſome part of the corroſive fluid along with it. To which, if we add antiſeptics and detergents, to check the progreſs of the mortification, and to cleanſe the ſordid ulcers, every indication will be anſwered.

When the diſeaſe is mild, the ſymptoms favourable, the ſloughs ſuperficial, order a gargle of ſage-tea, with a few roſe-leaves in the infuſion. Three or four ſpoonfuls of vinegar may be mixed with half an ounce of the tea, with as much honey as will make it agreeably acid.

If the ſloughs are large, and are caſt off ſlowly, they may be touched with mel ægyptiacum, by means of an armed probe.

It is not uncommon for hectic heats, night ſweats, want of appetite, and dejection of ſpirits, to attend thoſe a conſiderable time who have had the diſeaſe in a ſevere manner. Aſſes milk commonly relieves them, together with a decoction of the bark and elixir vitrioli.

The cauſe of this diſeaſe ſeems to be a putrid virus, or *miaſma ſui generis*, introduced into the habit by contagion, principally by means of the breath of the ſick perſon.

The intentions of cure in this diſeaſe is to keep up the *vis vitæ*; to encourage the cuticular diſcharges; and to conquer the ſpreading putrefaction. Therefore, all evacuations which leſſen the ſtrength, particularly bleeding and purging, and all the nitrous antiphlogiſtic medicines, are highly improper.

And ſince a laxity of fibres prediſpoſes perſons to receive this diſeaſe, it is manifeſt, both with regard to the preſervation and cure, tonic medicines are indicated; and among thoſe the bark juſtly claims the firſt place.

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The only certain diagnoſtics of this diſeaſe are aphthous ulcers and ſloughs on the tonſils and parts about the pharynx.

Moſt perſons in the beginning have a nauſea and vomiting, and ſome a looſeneſs. Thoſe who are coſtive, have, upon the uſe of the gentleſt eccoprotics, immediately been ſeized with a diarrhœa, difficult to reſtrain. All medicines which tend to move the belly, not excepting rhubarb, are extremely dangerous.

Thoſe who have had the diſeaſe with moſt violence, have had the head always heavy and ſtupid, and the eyes foul and full of tears. Not a few have had the head covered with petechiæ and purple ſpots.

The firſt thing to be done is to order the hot ſteam of a boiling mixture, of vinegar, myrrh, and honey, to be received into the throat, through an inverted funnel. If it is neceſſary to make it ſtill more penetrating, add ſome of the *ſpirit. Mindereri.* This ſteam can ſcarce be uſed too frequently, provided it is received with a due degree of heat.

If the *primæ viæ* ſeem foul, or much loaded, it may be neceſſary to begin the cure by cleanſing the ſtomach with carduus tea, in which a little ſal vitrioli is diſſolved, and ſome other gentle and quick emetic. No other evacuation ſeems proper, and this is only to be uſed at the very beginning of the diſeaſe. If the phyſician is not called in ſoon enough, it will be neceſſary to begin immediately by giving the bark, joined with the *ſpir: Mindereri.*

The bark is moſt efficacious in ſubſtance; but when the ſtrength of the patient is much reduced, and the digeſtive powers weakened, which is uſual in putrid fevers, on the very firſt ſeizure, the decoction or extract may be thought preferable; but this laſt is ſeldom to be had genuine. In making the decoction, it ought to be done with as gentle a heat as poſſible, and then evaporate very ſlowly to procure the extract, leſt it be burnt too, and that the volatile parts may fly off as little as may be.

In the uſe of the *ſpiritus Mindereri*, care ſhould be taken that it be exactly neutralized; or rather, as the diſeaſe is putreſcent, that it may incline towards the acid. This is particularly of uſe where the heat is very great, it being very attenuating and antiſeptic.

When the putrefaction is ſufficiently conquered, it will be neceſſary to cleanſe the firſt paſſages with a ſmall doſe of rhubarb; which is to be repeated at proper intervals, continuing the bark, *&c.* on the intermediate days for a conſiderable time.

To complete the cure, the patient ſhould enter into a courſe of balſamics, chalybeate waters, with elixir vitrioli, and the like, in order to ſtrengthen the ſolids and invigorate the blood; for this diſeaſe is liable to return, eſpecially if they have afterwards a fever of the putrid kind.

Of a PHRENZY.

A PHRENZY, if a primary diſeaſe, is a true inflammation of the dura and pia mater; if ſymptomatical, the inflammatory matter is tranſlated into the meninges of the brain from ſome other part.

The primary phrenſy is preceded by heat and a violent inflammatory pain within the head, a redneſs of the eyes and face, unquiet and troubled ſleep, a ſlight degree of folly, watching, ſadneſs, fierceneſs, ſudden forgetfulneſs, a gathering of threads from the bedcloaths.

A ſymptomatic phrenſy ſucceeds any acute diſeaſe; but it is worſt when it is preceded by an inflammation of the pleura, lungs, or diaphragm. A black tongue, an obſtinate coſtiveneſs, ſuppreſſion of urine, white fæces, which is always a fatal ſign, pale, diſcoloured, thin urine, a wildneſs in the looks and actions, with a red viſage, a black cloud in the urine, and watching, are ſigns of an approaching inflammation in the head.

The ſymptomatic phrenſy ſometimes appears in the ſtate of malignant, eruptive, and ſpotted fevers, the ſmall-pox, malignant catarrhal fevers, camp-fevers, particularly the Hungaric. It generally ſupervenes about the critical days, with a rigor, trembling of joints, tenſion of the præcordia, and coldneſs of the external parts, with thin urine. The patient being weakened with the preceding diſeaſe and long watching, which debilitates the tone of the veſſels of the membranes of the brain; whence the ſtaſes are not to be reſolved, and whence the patient is generally killed on the third day.

A phrenzy is to be diſtinguiſhed from that ſlight alienation of mind which happens in acute fevers before the critical eruption. This goes off readily, nor is the urine thin and watery, nor is it attended with a rigor and a refrigeration of the external parts. It is alſo to be diſtinguiſhed from a deſipience and raving, from a great loſs of ſtrength and weakneſs of the brain after the declination of an acute fever; for this will go as the ſtrength returns, either ſpontaneouſly, or with proper remedies.

Both kinds, when preſent, have the following ſymptoms:

A deprivation of the ideas of ſenſible things, as alſo of the faculties of the mind and affections; an unruly fierceneſs and wildneſs; an unquiet and often turbulent ſleep, a reſpiration ſlow and great, the face often exceeding red, the aſpect grim, the looks fierce, the eyes wild and protuberant, a dropping of the noſe.

A phrenzy is generally fatal on the third, fourth, or ſeventh day; which laſt it ſeldom exceeds.

When it does, and is violent, it often ends in madneſs; which increaſing gradually, the patient becomes raving mad.

The aliment ought to be ſlender, of farinaceous ſubſtances, as water gruel acidulated; the drink, barley-water, ſmall-beer, or the decoction of tamarinds.

This diſeaſe, of all others, requires the ſpeedieſt applications. Profuſe hæmorrhages of the noſe often reſolve it; and copious bleeding, by opening the temporal arteries, is the moſt efficacious remedy.

The cure of this diſeaſe requires diligent attention to the following things:

Varices of the veins, or the bleeding piles, are beneficial.

A looſeneſs is likewiſe good.

A pain in the breaſt and feet, or a violent cough ſupervening, often put an end to the diſeaſe; as alſo an hæmorrhage.

Therefore plentiful bleeding is neceſſary, through a large

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large orifice; or open several veins at the same time, *viz.* the *jugular*, the *frontal*, and a vein in the foot.

Hoffman prefers the bleeding at the nose, procured by thrusting up a straw, a pen, or a skewer; or, as Pringle advises, apply six or seven leeches to the temples. The rest of the cure consists in blisters, and things common to other inflammatory fevers.

The cure of the symptomatic phrenzy, if the pulse will bear it, is by opening a vein; but if this cannot be done by reason of great lowness, it is to be attempted by leeches and blisters. It is usual to begin with blistering the head, but in military hospitals that is to be left to the last. The best internal medicines are nitre and camphor. Hoffman's proportion is six grains of nitre to one of camphor; small doses of which are to be often repeated.

The patient's drink should be sweet whey, or acidulated by turning the milk with citron or lemon juice, and sweetened with *syr. e meconio*. To every quart add a dram of purified nitre or sal prunella. Also emulsions are convenient, of the four cold seeds, with barley-water, to every quart of which add two scruples of nitre.

Antiphlogistic clysters are likewise proper: but if all these means fail, recourse must be had to cupping in the lower parts, to opiates, and mild blisters.

Of the Pleurisy.

The pleurisy is most predominant between the spring and the summer.

It begins with chilness and shivering, which are soon succeeded by heat, thirst, inquietude, and the other common symptoms of a fever.

After a few hours the patient is seized with a violent pricking pain in one of his sides, about the ribs; which sometimes extends itself towards the shoulder-blades, sometimes towards the back-bone, and sometimes towards the fore-parts of the breast; and this is attended with frequent coughing.

The matter which the patient spits at first is little and thin, and mixed with particles of blood; but as the disease advances, it is more plentiful and more concocted, but not without a mixture of the blood.

The fever keeps an equal pace with the cough, pain, and spitting of blood; and in proportion as the expectoration becomes more free, it sensibly decreases; sometimes the body is costive, sometimes too open.

The blood drawn from a vein, as soon as it is cold, looks like melted suet.

In this disease the pulse is remarkably hard, and seems to vibrate like a tense string of a musical instrument, which is the pathognomonic sign.

Hence pluriſies are distinguished into the moist and the dry. It is likewise observable, that the pain in the side is more intense at the time of inspiration, but more mild at the time of exspiration.

There is no fever wherein the crises are more regular than in the pleurisy and peripneumony: for in young persons, and those of a full habit of body, bloody spittle generally appears on the fourth day, and on the seventh the disease terminates by a profuse sweat. But in the phlegmatic and more inactive, as also those in whom the disease has taken deeper hold of the lungs, it will continue till the eleventh or fourteenth day; going off partly by expectoration, partly by sweat: then the pulse becomes more soft, and the patient falls into an easy refreshing sleep.

But when on critical days the crisis is imperfect, there is indeed a sweat; but it neither eases the patient, nor terminates the disease. When it continues till the twenty-first day, there is reason to fear a dangerous abscess in the breast. It is therefore a good sign when the expectoration proceeds from the bottom of the lungs, bringing up a viscid matter on the fourth day, mixed with blood, afterwards yellow, and sometimes purulent. The sooner the expectoration happens, the greater the hopes of recovery.

A looseness is not safe; urine without a sediment is a suspected sign; and a profuse sweat, unless on critical days, is still worse. On the eleventh and twelfth days a looseness is not much to be feared, unless too great, for it sometimes carries off purulent matter. If a bleeding at the nose happens about the fourth day, it is generally attended with a remarkable alteration of the disease.

Those who die of an inflammation of the lungs are suffocated, because the matter adhering to the vesicles and bronchial ducts cannot be coughed up.

In all inflammatory fevers, too hot a regimen is to be shunned, both with respect to the bedcloaths and the heat of the room; nor must the patient be exposed to the cold air, nor drink things actually cold. Likewise all strong sudorifics, diuretics, and cathartics, are hurtful. Nor, if the patient has three or four stools, must the course of nature be stopped.

The Diet should be cooling, relaxing, slender, and diluting. Moistening things taken warm are preferable to all others. Hence, barley oroat meal gruel, sweetened with honey, is proper; as also sweet whey.

The indications of cure are, 1. To prevent the farther stasis and stagnation of the blood. 2. To dilute and dissolve the lentor of the blood in pleuritics. 3. To mollify, ease, and relax the spasm, pain, and copious afflux, in order to put the impacted blood again into motion by the help of the appulse of the arterial blood. 4. To promote the excretion of the viscid, bloody, and purulent matter, adhering to the bronchia of the lungs, so that it may be brought up and an abscess prevented.

Take away ten ounces of blood on the side of the part affected. If the physician is called before the third day, the patient lying on his back, must lose a large quantity of blood from a wide orifice in a large vessel, and fetch deep sighs, or cough, to promote its celerity; and the part affected should be rubbed gently at the same time. The bleeding should be continued till the pain remits, or the patient is ready to faint. It should be repeated as often as the symptoms return which it was intended to remove. The absence of the white inflammatory pellicle from the surface of the blood, when cold, shews it is time to leave it off. This Huxham confirms by his own experience; and adds, that after the fourth day bleeding is not safe. He likewise recommends fomenting the part; which often eases the pain, and terminates the disease. But if it is obstinate, he recommends slight scarifications; then cupping;

and afterwards a bliſter on the ſame place, which has been ſucceſsful when the uſual methods failed. An emollient cooling clyſter ſhould immediately ſucceed bleeding, eſpecially if the body is coſtive; and nitrous medicines, with a cooling, emollient, diluting regimen, ſhould be forthwith entered upon. Thin whey, a decoction of barley and red poppies, and emulſions, will ſerve for drink.

Though the ſymptoms ſhould vaniſh on bliſtering, it will be more ſecure to bleed again; unleſs a profuſe ſweat comes on with relief from pain, and makes all other remedies unneceſſary. But if the lungs are likewiſe inflamed, the cure cannot be ſo ſpeedy; for though the firſt bleeding and a bliſter ſhould give eaſe, yet a repetition will be needful. Sometimes the ſtitch returns and fixes on the other ſide; but this may be treated as the firſt with the ſame ſucceſs.

Huxham lays a great ſtreſs on camphor and nitre joined with ſmall doſes of the paregoric elixir; and if there is a vehement pain, he thinks opiates may properly be joined with them, as they have a great power of relaxing the over tenſe fibres, of moderating the too rapid courſe of the blood, and of promoting the concoction of the morbific matter. Hence, after the uſe of opium, there is generally a copious ſediment of the urine.

It is neceſſary that the body be kept open, and the bowels free from ſpaſms; to which purpoſes emollient clyſters are proper, with oil of ſweet almonds.

In the firſt ſtage of the pleuriſy or peripneumony, laxative clyſters and the cooler diaphoretics are proper; but all cathartics and warm ſudorifics do harm. The time for attempting the diaphoretics is when the perſon finds eaſe by the bliſter: But whenever the ſpitting begins, the diaphoreſis muſt either be omitted, or joined to expectorants; whereof the chief is oxymel of ſquills; or, in great heat or drought, ſome more pleaſant acid. But in lowneſs, after repeated bleedings, give ſalt of hartſhorn joined to ſome oil: This will raiſe the pulſe, and promote expectoration when it flags.

If, notwithſtanding the diſcharge, the breaſt continues to labour, bleeding is ſtill requiſite: For the lungs are not to be overpowered by the omiſſion of bleeding; nor is the ſuppreſſion of the ſpitting to be hazarded by bleeding too freely. But with regard to bliſters, there need little caution; as they are always ſeaſonable, to raiſe, relieve the breaſt, and to promote expectoration.

In the courſe of expectoration, a vomit will ſometimes be uſeful in diſcharging the load of viſcid phlegm. If the phlegm is tough, or the patient coſtive, and opiates are given, they muſt be joined with ſquills.

When the pleuriſy ends in a ſuppuration, or abſceſs, the ſigns are, a ſlight vague ſhivering, which often returns without any evident cauſe; a remiſſion of the pain, while the difficulty of breathing remains; a redneſs of the cheeks and lips; thirſt; a febricula, or ſlight fever, eſpecially in the evening; a weak, ſoft pulſe.

When the abſceſs is actually formed, there is an obſtinate dry cough, which increaſes after feeding or motion; the breathing is difficult, ſmall, thick, ſhort, and wheezing, worſe after eating and motion; the patient can only lie on the ſide affected; a ſlow, periodical fever, which is exaſperated with ſtirring and eating; a decayed appetite, great thirſt, nocturnal ſweats, paleneſs, leanneſs, and exceſſive weakneſs.

This either ends in a conſumption; or the matter falls into the cavity of the thorax, and ſo becomes an empyema.

Of the BASTARD PLEURISY.

HOFFMAN ſays, that the ſeat of every genuine pleuriſy is in the lungs, as appears from the opening of thoſe that die of this diſeaſe.

Therefore, if the inflammation occupies the externa parts only, it is a BASTARD PLEURISY: if the externa ſurface of the lungs, like an eryſipelas, it is a genuine pleuriſy.

A BASTARD PLEURISY is attended with a very acute and pricking pain in the ſide, which is exaſperated by the touch; lying on the affected ſide is difficult; there is a dry cough, without the ejection of purulent or bloody matter, which, if ſtrong, increaſes the pain. There is likewiſe a fever, with a hardiſh, depreſſed, and frequent pulſe.

The cauſe does not ſeem to be in the blood, but rather in the ſtaſis of an acrid ſerum at the connection of the ends of the fine azygous arteries and veins; as alſo of the lymphatic veſſels of the pleura, and likewiſe in the periofteum of the ribs, where the ſenſe is more acute.

Hence it is nothing elſe but a kind of rheumatiſm, and is common to thoſe who are now and then troubled with catarrhs, rheumatic and arthritic pains, or a hemicrania; eſpecially if they come out of a hot air into a cold, or the contrary, particularly in the evening.

This does not require bleeding, unleſs there is a remarkable plethora; but a diaphoreſis, and a more free perſpiration. On the ſeventh day it generally diſappears, and is without danger.

Lancifius adviſes to bleed plentifully in the arm, and to ſcarify the part affected. After this two cupping glaſſes are to be applied thereto, which will cure the diſeaſe as if by enchantment.

Hoffman obſerves, that thoſe are apt to fall into a baſtard pleuriſy who are much expoſed to a moiſt cold autumnal or wintery air: For there are no diſeaſes or inflammatory fevers ſo ſoon generated by the intemperies, inequality, and change of the air, as thoſe of the breaſt. When the ſummer has been hot and dry, and the weather has ſuddenly changed to cold, with a northerly wind, not only cartarrhal defluxions have enſued, but rheumatiſms and pleuriſies, with bloody ſpittle and violent pains in the ſide, have been very frequent. For the air, from continual inſpiration, immediately affects the lungs internally, and externally the thorax and ribs, which are beſet with thin muſcles, membranous nerves and veſſels; for which reaſon ſpaſtic criſpatures are readily induced, and the free circulation of the humours ſtopt.

The beſt way is to keep the part affected in a temperate and equal heat, in a warm bed; eſpecially as the ſkin of every patient, as in the gout and eryſipelas, cannot bear topics.

Of

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Of a PERIPNEUMONY.

THERE are ſeveral kinds of this diſeaſe. For it may ariſe from a violent inflammation of the lungs, by a very fizy denſe blood obſtructing very many of the pulmonic and bronchial arteries: or from an obſtruction of the lungs by a heavy, viſcid, pituitous matter; which is called a ſpurious or baſtard peripneumony: or from a thin, acrid defluxion on the lungs; and then it is a catarrhal peripneumony.

The ſymptoms common to all, are, a load at the breaſt, a ſhort difficult breathing, and more or leſs of a fever. But in a true peripneumony, there is a more tenſive pain than in the pleuriſy; beſides, it is rather more obtuſe and preſſing than acute, and ſhoots as far as the back and ſcapulæ. But the difficulty of breathing is greater, as well as the anxiety and expectoration, whereby a variegated ſpittle is brought up, which lay as it were deep: for in this diſeaſe the veſſels of the lungs themſelves, whereby the blood circulates from one ventricle of the heart to the other, are affected; being ſtuffed and obſtructed with a thick blood, which is apt to grow more viſcid and ſolid. Wherefore it is the more dangerous and fatal, eſpecially if it attacks old perſons, and if bleeding is not timely adminiſtred. Boerhaave ſays, the pulſe is ſoft, ſlender, and in every ſenſe unequal; and Huxham, that if the pulſe is hardly felt before bleeding, it will afterwards beat very ſtrongly.

In the cure, great regard muſt be had to the different ſtages of this diſeaſe, and the different ſymptoms that attend it. Bleeding is indiſpenſably neceſſary at the beginning of a ſevere inflammation of the lungs; but if, after the ſecond or third bleeding, the patient begins to ſpit a well concocted matter, freely tinged with blood, you muſt forbear to repeat it, otherwiſe the patient will be weakened, and a fatal ſuppreſſion of the expectoration will enſue. But if he brings up a conſiderable quantity of florid, thin, ſpumous blood, by ſpitting; then bleed again, quiet the cough with diacodium, and give proper acids pretty freely, with ſoft cooling incraſſants. If a thin, gleety, dark-coloured matter is expectorated, it is generally a mark of greater malignity, and that the blood is in a putrefying diſſolving ſtate, and will not bear a large loſs of blood.

Generally the more violent the rigor or horror is at the attack, the more violent the ſucceeding fever will be, which will in ſome meaſure guide us in drawing of blood. If the ſymptoms are not relieved by the firſt bleeding, after eight, ten, or twelve hours, let it be repeated; or ſooner, if they become aggravated. If the fever, anxiety, oppreſſion, and difficulty of breathing, increaſe, bleed again, eſpecially if it appears very firm and denſe, or covered over with a thick yelloviſh coat or buff. However, it does not appear ſometimes till the ſecond or third bleeding, though the ſymptoms indicate a very high inflammation. This often happens from the blood not ſpouting out in a full ſtream. This appearance of the blood, with a firm ſtrong pulſe, will warrant the taking away more, till the breathing becomes free and eaſy.

If the craſſamentum is of a very looſe texture, and not covered with a buff coat, and the pulſe on bleeding ſinks, flutters, or grows more weak and ſmall, it is time to deſiſt. A bluiſh film on the blood, with a kind of a ſoft greeniſh jelly underneath, while the cruor itſelf is livid, looſe and ſoft, with a turbid, reddiſh, or green ſerum, is a ſign of a very lax craſis of the blood, and great acrimony, which will not bear great quantities to be drawn off. If the blood is very florid, thin and looſe, with little or no ſerum after ſtanding for ſome time, it generally argues a conſiderable advance to a putrid and very acrid ſtate.

A ſtrong, throbbing, thick pulſe, always indicates farther bleeding; at leaſt till the patient breathes more eaſily, or a free expectoration of laudable matter is obtained. It often happens, that the pulſe at the very beginning ſeems obſcure and oppreſſed, irregular, ſluggiſh, and ſometimes intermitting, with weakneſs and oppreſſion. But this does not ariſe from the defect, but from the too great quantity of blood; for the blood-veſſels being over-loaded and diſtended, cannot act with ſufficient vigour. This is ſucceeded with a dreadful train of ſymptoms, and even death itſelf, if not prevented with ſufficient bleeding.

In ſome very violent peripneumonies, an immediate and exceſſive weakneſs comes on, with an inexpreſſible anxiety and oppreſſion of the breaſt; a very ſmall, weak, trembling pulſe, coldneſs of the extremities, with clammy, coldiſh, partial ſweats, the eyes ſtaring, fixed and inflamed, the face bloated and almoſt livid. This has ſoon been followed with a ſtupor, delirium, and ſometimes with a complete paraplegia.

Some kinds of peripneumonies will not bear large bleeding, eſpecially the epidemic or malignant. The pulſe and ſtrength of theſe patients have ſunk to a ſurpriſing degree; and the diſeaſe has turned into a ſort of a nervous fever, with great tremors, ſubſultus tendinum, profuſe ſweats, or an atrabilious diarrhœa, with a black tongue, coma, or delirium; though at the beginning the pulſe ſeemed to be full and throbbing, and the pain, cough, and oppreſſion ſo very urgent, as to indicate bleeding pretty ſtrongly. In theſe caſes the blood was ſeldom buffy to any conſiderable degree, but commonly very florid, of a very looſe and ſoft conſiſtence, or very dark-coloured, and coated with a thin and bluiſh or greeniſh film, under which was a ſoft greeniſh jelly, and a dark livid cruor at the bottom. Sometimes the coat was much thicker and more tough, but of a pale red colour, reſembling the cornelian ſtone, or a dilute jelly of red currants. When the blood is thus diſſolved, abſtain from farther bleeding, eſpecially if the pulſe or patient becomes more languid after it, though the oppreſſion, load, or even pain, may ſeem to require it.

When the fizy coat on the blood is exceſſively tough, and extremely yellow, or of a pale red colour, it threatens danger; for the inflammatory lentor will ſcarcely mix with any diluents. Sometimes, after repeated bleeding, the craſſamentum has ſcarce been a ſixth part of the volume of the blood, and yet as ſolid as a piece of fleſh. This is generally mortal.

When the peripneumonic ſymptoms continue for four or five days or more, we may juſtly fear an abſceſs, or a mortification; and little advantage is to be expected from farther

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farther bleeding. But if the pain returns with violence after having ceased a considerable time, it is a sign that a new inflammation is forming, which indicates bleeding as much as the primary, but not in the same degree. The strength of the patient and pulse, the violence of the pain and difficulty of respiration, are, in a great measure, to determine the quantity. When the pulse and strength seem to require bleeding, cupping on the shoulders will relieve the breast and head. Likewise the use of blisters, issues, setons, are very serviceable in inflammations of the longs.

Laying a blister on the part affected is the proper cure of a pleurisy; but a peripneumony is naturally more dangerous; and the more so as the epispastic cannot operate so directly on the lungs as the pleura. But even in this case, blistering is most to be relied on after bleeding. You may first blister the back, and afterwards one or both sides. Epispastics tend to relieve the breast, not only when applied to the chest, but also to the extremities; and promote expectoration: Whereas bleeding must be used cautiously, if at all, after the spitting appears.

The fever and the inflammation require a cool, diluting regimen, and nitrous and relaxing medicines; together with a moderately cool, free air, and quiet both of body and mind. A close room is very incommodious; if it cannot be avoided, it should be prudently aired. There is nothing more proper than thin whey, a barley ptisan with liquorice, figs, &c. the infusion of pectoral herbs, such as ground-ivy, maiden-hair, colt's-foot, hyssop, &c. These should be gently acidulated with juice of Seville oranges or lemons. Honey will render them more detergent. Any or all these things may be drank warm by turns in frequent small draughts, sipping them as it were perpetually. These relaxing, emollient drinks, and vapours arising from them, are in a more essential manner necessary, when the expectoration is very difficult and tough. When it is suddenly suppressed, and the difficulty of breathing greatly augmented, an emetic of oxymel of squills will be proper, if the violence of the fever is abated; but very little should be drank after it to promote vomiting.

When much sincere, florid, or frothy blood is spit up, take away as much blood immediately as the patient's strength will bear. If the hæmoptoe continues, bleeding in the saphœna will be found of the utmost service. Then direct cooling emulsions, nitrous, demulcent, and mucilaginous medicines; and vegetable and even mineral acids, if the spitting of blood is very considerable. The drink may be a decoction of red poppies, colt's-foot, and figs, acidulated with elixir of vitriol. The cough may be appeased with diacodium, or a soft linctus. But strong astringents and large doses of opiates are bad.

In a CATARRHAL PERIPNEUMONY, the matter expectorated is extremely thin and crude, and the defluxion so very acrid as to excoriate the wind pipe, causing an incessant and very violent cough. Here, a great loss of blood is not necessary; but some should be drawn in the beginning to abate the inflammatory disposition. Blisters should be applied early, and purgatives are proper to carry off the serous colluvies. A demulcent, pectoral ptisan is proper to temperate the acrimony of the humours. It should be taken warm with mild diaphoretics, Coffee is a useful drink. Direct *diacodium*, or *elixir paregoricum*, to moderate the cough, in small doses often repeated: *sperma ceti*, *olibanum*, *myrrh*, and *camphor*, tend to incrassate the thin catarrhal humour, and abate the irritation.

In the PUTRID PERIPNEUMONY the expectoration is livid, gleety, and sanious, frequently resembling the lees of red wine; sometimes more black, and sometimes very fetid. This is often the case of the highly scorbutic; particularly sailors, after a long voyage. Blood taken from these, appears to be in a dissolving putrescent state. The crassamentum is loose and tender, the serum turbid and reddish; the tongue is black; the teeth furred with a dark, thick sordes; the breath offensive; the urine high coloured or blackish. Black spots, or a dysentery, frequently appear on the fifth, sixth, or seventh day. The pulse and strength sink after bleeding: sometimes a vast anxiety, fainting, a cold sweat, a thready intermitting pulse soon after. This has sometimes happened in in pleuro-peripneumonies, where the pain of the side was violent, the load at the breast great, and the cough considerable.

This will never bear a second bleeding to advantage; seldom the first, unless there is a considerable degree of firmness and tension in the pulse. When there is reason to be diffident, order scarifications and cupping.

In this disease give a decoction of figs, colt's-foot, and red poppies, well acidulated first with juice of Seville oranges or lemons, and afterwards with *gas sulphuris* or *elixir vitriol*. nitre, olibanum, myrrh, flowers of sulphur and bole may be administred, with *conserv. lujulæ*, rob of elder, currants, mucilage of quince-seeds, and *syrup. de rubeo idæo*: camphorated vinegar, with syrup of elder or rasberries, is an excellent medicine. A spoonful or two of these latter should be given ever and anon. Sound cyder, and wine and water with Seville orange or lemon juice, drank warm, promote expectoration when deficient. Tincture of roses with red poppy flowers, has moderated an inordinate defluxion of this bloody ichor. However, oxymel of squills, and strong cinnamon-water, are frequently necessary to pump up the ichor, when a great rattling in the throat and difficulty of breathing indicate a vast quantity of it in the lungs. And yet the violence of the cough may be often appeased by elixir asthmaticum or diacodium. The patient is to be supported with sago, panada, hartshorn jelly, roasted apples, cream of barley, or thick gruel, with a little wine and juice of lemons, giving a little at a time, and often. Strawberries, rasberries, currants, cherries, may sometimes be indulged.

At the close, the whole depends on a well-regulated diet. A toast with diluted red port wine, mulled with Seville orange-peel, mace, or cinnamon, and well acidulated, may be very useful. Blisters are seldom beneficial in this case, but often mischievous.

A very thin yellow spitting, either shews that nothing but the thinnest part of the blood is strained through the arteries of the lungs, or that the whole mass of blood begins to dissolve; that its bilious principles are highly exalted, and that all tends to a general putrefaction. It is commonly

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monly attended with a violent cough, and expectoration is performed with exceeding great difficulty. Many times it is ſucceeded by an hæmoptœ from the rupture of the veſſels; particularly when the tongue appears very red, ſmooth, dry, and ſhining, with a kind of livid bladders at the top.

The concocted matter of inflammatory obſtructions of the lungs is partly ſpit off, and partly carried off by thick turbid urine in large quantities, depoſiting much reddiſh or yellow-coloured ſediment; and ſometimes partly by bilious ſtools. Nothing promotes this urine, and theſe ſtools, more effectually than laxative clyſters. Sometimes the morbid matter is critically tranſlated to the legs, to the great relief of the breaſt; and therefore, in ſevere pulmonic diſorders, a derivation of the humours to the legs may be attempted by tepid bathing and bliſters. The diſcharge from the ulcerated bliſters muſt not be ſuddenly ſuppreſſed; for then the difficulty of breathing and cough will return, or a very great purging or profuſe ſweats will ſucceed.

If the patient is not relieved in eight days, the inflammation will end in a ſuppuration, and an abſceſs of the lungs, and ſometimes in ſome other part of the body; the ſymptoms of which are an obſtinate dry cough, which motion and taking of food will increaſe. The eaſieſt poſture in lying will be on the affected ſide; there will be a ſlow fever, with chilneſs and ſhivering at uncertain periods; exacerbations after motion or a repaſt; thirſt, night ſweats, a frothy urine, paleneſs, leanneſs, weakneſs. In this caſe, bleeding muſt be forborne; the diet muſt be mild, ſoft, incraſſating, and more plentiful. Tepid vapours ſhould be taken into the lungs, of decoctions of proper ingredients.

When by the ſymptoms and time the impoſthume may be judged to be ripe, the vapour of vinegar itſelf, and any thing which creates a cough, as oxymel, exerciſe, and concuſſion, are proper. The ſooner it is broke, the leſs danger to the lungs.

In this ſtate, which is not abſolutely deſperate, the aliment ought to be milk, and the drink milk and barley-water, with gentle anodynes, that the patient may have ſome reſt. If the inflammation ends in a gangrene, the caſe is deſperate; if in a ſchirrus, incurable.

Of the Bastard Peripneumony.

At the beginning of the fever the patient is hot and cold by turns, is giddy upon the leaſt motion, and complains of a rending pain of the head whenever he coughs; he vomits up every thing that he drinks; the urine is turbid, and intenſely red; the cheeks and eyes look red and inflamed; his breathing is thick and ſhort; the whole thorax is full of pain, and the ſtraitneſs of his lungs, as often as he coughs, is perceived by the by-ſtanders: whence the free courſe of the blood is prevented, which creates a ſtoppage of the circulation, and takes away all the ſymptoms of a fever, eſpecially in thoſe of a full habit of body; this may alſo happen from the blood's being overloaded with a great quantity of pituitous matter, which oppreſſes it ſo as to prevent a febrile ebullition.

This diſeaſe ſometimes ſteals upon the patient unawares, with a ſlight wearineſs, a weakneſs, a general proſtration of the faculties of the mind, thick and ſhort breathing, beginning with an oppreſſion of the breaſt. The commotions it excites are ſo ſmall, that the heat and fever are ſcarce ſufficient to make the patient ſenſible of his danger. Afterward, ſlight ſhiverings which come on by fits, and the attacks of a gentle fever, appear; whence the difficulty of breathing and weakneſs ſuddenly increaſing, bring on death.

When perpetual, laborious wheezing, great anxiety and conſtant oppreſſion on the præcordia, comatous ſymptoms, cold extremities, and dark bad-coloured nails and viſage come on, the patient is in immediate danger.

When comatous ſymptoms and a very difficult breathing remain after bleeding, cup and ſcarify the neck and ſhoulders. This has frequently had a ſurpriſing effect. When the caſe is very threatening, bliſter the ſcarifications.

After bleeding, let the patient have the following clyſter, which muſt be repeated daily till the lungs are relieved.

Take 3 ounces of honey, the yolk of an egg, and 8 ounces of barley-water. Make them into a clyſter.

Let the patient's diet be very ſlender, ſuch as weak broths, ſharpened a little with orange or lemon juice, and he may drink a weak mixture of honey and water; the ſteams of warm water may be taken in at the mouth.

Likewiſe let the legs and feet be bathed, and large bliſters applied. Sydenham adviſes a repetition of the bleeding and purging alternately, every other day, or at greater intervals, as the ſtrength and ſymptoms require. But he has generally found twice bleeding ſufficient.

Of the Inflammation *of the* Liver.

When the liver is inflamed, it compreſſes the ſtomach, diaphragm, and the neighbouring viſcera of the abdomen; it ſtops the circulation of the fluids, hinders the generation and excretion of the gall, and all digeſtion. It produces a great many bad ſymptoms, as the jundice, with all the diſeaſes depending thereon; for the liver receives the refluent blood from almoſt all the parts of the abdomen, and is the chief inſtrument of almoſt all the digeſtions that are made there.

A fever, an inflammation, and pungent pain on the region of the liver and diaphragm, a tenſion of the hypochondria, yellowneſs of the ſkin and eyes, and a ſaffron-coloured urine, are ſigns of an inflammatory diſpoſition of the liver.

It begins with cold and ſhivering, ſometimes with vomitting and a fever, watching, difficult breathing, inquietude, and coſtiveneſs. This is a kind of rheumatic or eryſipelatous fever, proceeding from a ſharp viſcid ſerum, lancinating the nervous fibrillæ. It is ſometimes accompanied with a baſtard pleuriſy, to which it is akin.

It is not very dangerous, and rarely kills, unleſs the viſcera are unſound.

Narcotics and ſudorifics are to be ſhunned.

This diſeaſe terminates as other inflammations, being cured by reſolution, concoction, and excretion of the morbid matter; or elſe in an abſceſs, ſchirrus, or gangrene.

During the firſt ſtate, a warm regimen and ſaffron are improper.

Cooling reſolving liquors, taken inwardly, as whey with

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with ſorrel boiled in it. Outward fomentations, and frequent injections of clyſters, bathing, and frictions, relax, and render the matter fluid. Honey, with a little Rheniſh wine, or vinegar; the juices and jellies of ſome ripe garden fruits; and thoſe of ſome lacteſcent plants, as endive, dandelion, and lettuce, are reſolvent.

Fat oily epithems, and plaiſters, are to be ſhunned. Camphor in croceated ſpirit of wine is only to be uſed in the beginning, or when the fever is moderate, and nature ſluggiſh. Bleeding at firſt is neceſſary on the affected ſide, in the hand or foot.

Violent purging hurts; gently relaxing the belly relieves: diluents, with nitrous ſalts, are beneficial, or tamarinds boiled in warm water or whey.

A clyſter purely oleous is beneficial, with a bladder-full of an emollient decoction. Inwardly, diluting and reſolvent mixtures.

If it is attended with the jundice, then apply epithems of *carduus benedictus*, ſcordium, wormwood, elder-flowers, chamomile, ſeeds of lovage and cummin boiled in wine, and often applied.

Pringle ſays, the beſt remedy, after plentiful bleeding, is to lay a large bliſter over the part affected.

Bloody ſtools, not in an extreme degree, or ſtreaked with blood, ought not to be ſtopped, becauſe they help to reſolve the diſtemper: bleeding at the noſe often does the ſame.

The feveriſh matter is frequently carried off by urine; and therefore diuretics not highly ſtimulating are proper.

Sweating ought not to be promoted by hot cordials, but encouraged by warm diluting liquors.

The caſe is deplorable, when the inflammation terminates in a ſuppuration, unleſs the abſceſs points outwardly, ſo as it may be opened. For if the pus is evacuated into the abdomen, it produces putrefaction, or an incurable hepatic dyſentery or bloody-flux.

Of a PARAPHRENITIS.

THIS diſeaſe is an inflammation of the diaphragm, and parts adjacent. A paraphrenitis is attended with a very acute continual fever, an intolerable inflammatory pain of the part affected; which is extremely augmented by inſpiration, coughing, ſneezing, repletion of the ſtomach, a nauſea, vomiting, compreſſion of the abdomen in going to ſtool or making water. Hence, the breathing is thick, ſhort and ſuffocating, and performed only by the motion of the thorax. There is alſo a conſtant delirium; a drawing of the hypochondria inwards and upwards, an involuntary laughter, convulſions, and madneſs.

This diſeaſe terminates as in a pleuriſy; but is attended with more violent ſymptoms, and is much more fatal. If the part affected ſuppurates, the matter will fall into the abdomen, and produce a purulent aſcites.

The cure muſt likewiſe be attempted in the ſame manner as in a pleuriſy.

Of the INFLAMMATION *of the* INTESTINES.

THIS diſeaſe contracts the inteſtines, and ſtops up the paſſage through them. There is a vehement, fixed, burning pain, which is irritated by things taken inwardly. When the inflammation is in the upper part of the inteſtines, the ſtomach will be greatly diſtended by wind. When the pain is exaſperated, it produces convulſions of the diaphragm and abdominal muſcles, vomiting, painful inflations, with rumblings, and ſharp griping pains which may bring on the iliac paſſion, or twiſting of the guts.

When there is a burning pain in the abdomen, with a preternatural heat of the whole body, as alſo a quick pulſe, loſs of ſtrength, anxiety, and inquietude, the ſeat of the diſeaſe may juſtly be ſuſpected to be in the inteſtines. If the ſharp pain is above the navel and below the ſtomach, attended with a fever, nauſea, and reaching, it is a ſign that that part of the colon is affected which lies beneath the ſtomach, and is extended from the right to the left-ſide. If the pain lies in the right hypochondrium, under the ſpurious ribs, it ſhews that part of the colon to be inflammed where it joins to the ilium. When the complaint is of the left ſide, under the loins, where the pſoas muſcle is placed, it is a ſign the colon and that part of the meſentery joined thereto is the ſeat of the diſeaſe, eſpecially when it adheres to the peritonæum. But when the pain is in the middle of the abdomen about the navel, it ſhews the ſmall-guts are certainly affected. In all theſe caſes the pain is ſuppoſed to be attended with a fever.

When there is a fever, and a burning pain in the lower part of the belly, attended with a ſwelling, which ends in a copious, putrid, or purulent flux, with a great diſorder of the bowels, it ſhews the ſeat of the diſeaſe to be in the meſentery.

This diſeaſe ſhould careſully be diſtinguiſhed from a cholic proceeding from a cold cauſe, becauſe what is good for the latter is poiſon in the former. It muſt have a ſpeedy remedy, or it will ſoon end in the iliac paſſion or a mortification.

Beſides copious bleeding, there is hardly any other method of cure than fomenting and relaxing the bowels with emollient liquids, taken warm both by the mouth and in clyſters, and this every hour. Yet acids in very deſperate caſes have been known to give relief; ſuch as the juice of lemons taken by the mouth, and vinegar and warm water given in clyſters. When the vomiting is exceſſive and continual, opiates ſhould be given to quiet the convulſions.

Pringle affirms in this caſe, that the beſt method of cure is to lay bliſters over the part affected; and it has been practiſed with ſucceſs. In particular they are uſeful in the ileus, and ſeem to anſwer equally well in the fixed pains of the bowels, whether from an inflammatory or a flatulent cauſe.

Warm fomentations, or young, vigorous, and ſound animals, applied to the body, are extremely beneficial. ARBUTH. The patient ſhould only be nouriſhed with broths, in which gently detergent roots have been boiled. BOERH.

It is a fatal error of ſome practitioners, when they find the body obſtinately coſtive, to give one purge after another; which not only exaſperates the diſeaſe, but renders it mortal. Even the clyſters ſhould not be made of very ſtimulating ingredients; but of milk alone, with a little nitre; or rain-water, with ſyrup of violets; or of marſh-mallows, or roſes ſolutive.

After

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After bleeding and clyſters, if the pain ſtill continues violent, there will be no manner of danger in giving opiates, by which means the excruciating pain will be alleviated, the ſpaſms appeaſed, and a breathing ſweat will follow. When this is done, and the fever is abated, there will be no occaſion to continue the diluting, relaxing, and moiſtening medicines, but rather the nervous and corroborating.

If the patient ſurvives three days, and the acuteneſs of the pain abates, with a chilneſs or ſhivering throughout the body, it is a ſign of a ſuppuration: then within fourteen days the impoſthume will break; and if it falls into the cavity of the abdomen, it will corrupt the whole maſs of fluids, putrefy the viſcera, and turn to an aſcites; whence the patient will die of a conſumption.

In this caſe, whey and chalybeate waters are likely to prove moſt beneficial.

If the fever continues, with clammy ſweats, paleneſs, an ichorous diarrhœa, fetid, black, or like the waſhings of fleſh, a ſmall intermitting pulſe, and at laſt a total ceſſation of pain; they are ſigns of a gangrene and an approaching death.

Of the Nephritis, *or* Inflammation *of the* Kidneys.

The ſymptoms of a nephritis are, a great inflammatory, pungent, burning pain, in the place where the kidneys are ſituated, attended with a fever; the urine is made often, but ſmall in quantity, and very red or flame-coloured, yet, in the higheſt degree of the diſeaſe, watry. There is a numbneſs of the thigh, and a pain in the groin and the teſticle, of the ſame ſide; a pain in the ilium, bilious vomiting, and continual eructations.

When the inflammation is deep, the fever violent, the burning pain in the loins laſting, the difficulty of making water great, the body very coſtive, the anxiety and ſtraitneſs of the præcordia exquiſite, the urine crude and white; likewiſe if the pain continues till the fourteenth day, the kidney will ſuppurate; which is known from the abating of the pain, and from the thick purulent ſediment of the urine. This will ſometimes laſt ſeveral years, till there is nothing left of the kidney but a bag: It is attended with a hectic fever, and the patient before he dies is almoſt reduced to a ſkeleton. If the bag happens to burſt, it brings on a retention of urine, and intolerable pains, which end in death.

If it continues beyond the ſeventh day, an abſceſs is to be feared, which is known to be forming by a remiſſion of the pain, ſucceeded by a pulſation in the part, and chilneſs and ſhivering often returning.

When the diſeaſe is favourable, it is cured by reſolution, of a copious, red, and thick urine diſcharged at one time, or by a large flux of blood from the hæmorrhoidal veins, in the beginning of the diſeaſe.

It is cured by plentiful bleeding, revulſion and dilution; by ſoft, emollient, antiphlogiſtic decoctions.

When a burning and fixed pain in the loins continues for ſome time, it is a ſign that the venal veſſels are ſtuffed and obſtructed with a thick blood, which requires immediate bleeding in the foot; or if there is a diſpoſition to a hæmorrhoidal flux, apply leeches to the anus. Afterwards give ſuch things as temperate the heat of the blood, and promote a free circulation, with a diaphoreſis. For which purpoſe, emulſions, demulcents, diluents, antiſpaſmodics, diaphoretic powders, with cinnabar and nitre, are preferable to every thing elſe.

Emollient clyſters, without any ſaline or purging ſtimulus, are the principal help in this diſeaſe. They may be made of milk, whey, or ſoft water, in which elder and chamomile flowers have been boiled; to which add an ounce or two of ſyrup of marſhmallows, and a dram of nitre.

When there are convulſions, or exceſſive pain, opiates are proper. If the vomiting, a ſymptom of this diſeaſe, is too frequent, warm water ſweetened with honey is beneficial.

The patient ſhould avoid all acrimonious aliment; he ſhould neither lie too hot, nor on his back.

When an abſceſs is formed, the medicines muſt be powerfully maturating and emollient: When the urine appears purulent, they muſt be diuretics of medicated waters, whey, and the like; together with balſamics.

Emulſions are likewiſe uſeful of the four cold ſeeds and ſweet almonds. Some attribute a great virtue to cherry-tree gum diſſolved in whey or water, and taken often. Alſo ſyrup of marſhmallows is very uſeful. Add to theſe, the decoction of veronica, ſweetened with honey, and mixed with powder of nutmegs.

Butter-milk, not very ſour, has been reckoned a great ſecret in ulcers of the kidneys; and chalybeate waters have been beneficial to ſome. Spruce-beer is a good balſamic in this caſe.

Of the Inflammation *of the* Bladder.

The pathognomonic ſort of this diſeaſe are, an acute, burning, preſſing pain in the region of the pubes, attended with a fever, a continual teneſmus or deſire of going to ſtool, and a perpetual ſtriving to make water.

Other ſymptoms are, a rumbling of the bowels, gripping pains, great anxiety of the præcordia, difficult breathing, want of appetite, vomiting, coldneſs of the extreme parts, a hard, quick, unequal, contracted pulſe, inquietude, and ſometimes convulſions.

There is another kind which is more ſuperficial, and is either rheumatic or eryſipelatous, in which the fever is more eaſily and ſpeedily cured by promoting a diaphoreſis: And perſons in years, or who are affected with the ſcurvy, gout, rheumatiſm, or violent head-achs, are moſt ſubject to it; eſpecially if they catch cold by being expoſed to the rigour of a cold north-wind.

The former ariſes moſt commonly from the ſtoppage of the menſes, bleeding piles, or other uſual ſanguinary evacuations; and not ſeldom from a violent gonorrhœa unſkilfully ſuppreſſed by aſtringents, or when treated by medicines of too ſhurp and hot a nature.

This diſeaſe is mortal, if it terminates in an ulcer or mortification.

The cure muſt be attempted with bleeding in the feet, if a ſuppreſſion of the menſes or hæmorrhoidal flux be the cauſe.

If it proceeds from the ſcurvy, *&c.* recourſe muſt be had to gentle diaphoretics, diluents, and remedies which obtund

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obtund the acrimony of the humours, ſuch as decoctions of the roots of ſcorzonera, china, ſkirrets, and fennel; alſo infuſions, in the manner of tea, of the tops of yarrow, flowers of mallows, winter-cherries, and ſeed of daucus, made with milk, and ſweetened with *ſyrup de althæa* If the patient's body is coſtive, manna will be proper, with *nitrum ſtibiatum*; to which rhubarb may be joined, as occaſion requires.

Externally, antiſpaſmodics and gentle diſcutients will be proper: For this purpoſe apply bladders filled with a decoction of the emollient flowers.

If the teneſmus and difficulty of urine ariſe from ſpaſms, there is nothing better than the vapours of a decoction in milk of the flowers of melilot, elder, chamomile and mallows, and the tops of yarrow. This decoction may be put into a cloſe-ſtool; and the patient ſit over it.

Tulpius informs us, that a deſperate ulcer of the bladder was cured by the conſtant uſe of ſpaw-water.

Of the OPTHALMIA, *or* INFLAMMATION *of the* EYES.

AN inflammation of the membranes which inveſt the eye is a very common diſeaſe, eſpecially of the adnata or albuginous coat of the eye.

The eyes are very much inflamed, with great pain, tenſion, tumour, heat, and redneſs; and ſometimes there is ſuch a ſtrong ſenſation of pricking in the eye, as if it was cauſed by a needle or thorn. The eyes at firſt are full of ſcalding tears; which are followed by a pituitous matter, which is ſometimes ſmall in quantity, ſometimes more plentiful: a ſordes adheres to the greater angle of the eye; and when the diſeaſe is violent, the neighbouring parts will ſwell even as far as the cheeks, with a ſtrong pulſation of the adjacent arteries. The ſmall blood-veſſels are viſible, which in health are not to be ſeen, and all the white of the eye becomes red.

If, beſides theſe external ſigns, there is an appearance of moths, duſt, flies, *&c.* floating in the air, there is an inflammation of the retina.

As in all diſeaſes of the eyes, ſo eſpecially in their inflammation, the patient muſt abſtain from all ſpirituous liquors, the ſmoak of tobacco and ſternutatories; he muſt likewiſe avoid ſmoaky rooms, and the vapours of onions and garlick, as alſo all vivid lights and glaring colours. The drink may be water alone, or a decoction of fennel-ſeeds, hartſhorn, and barley; the aliment muſt be light of digeſtion.

Intemperance of all kinds renders perſons liable to this diſeaſe; as alſo a keen north-wind, and looking earneſtly at the fire, ſun, or glaring colours: likewiſe ſmoaky rooms, metallic vapours, coſtiveneſs, and unuſual refrigerations of the extreme parts, eſpecially in the time of menſtruation. Sometimes it is owing to other diſeaſes, as the ſmall-pox, meaſles, ſcurvy, and the driving back the gouty matter.

A ſlight ophthalmia is eaſily cured; a more ſevere one generally continues a month or longer, and often leaves a ſpot in the cornea, or depraves the humours of the eye.

The ſlighter inflammations from duſt or the ſun are removed by fomenting with warm milk and water, and anointing the eyes with tutty ointment at night: if the eyes are weak and but little inflamed, they may be waſhed with brandy and water.

In all caſes we are to look narrowly and often into the inflamed eye; ſince the inflammation may be either begun or be kept up by moats, or by hairs of the cilia falling in, or growing inwards, ſo as to cauſe conſtant irritation.

Take away 10 ounces of blood, and the next morning give the common purging potion, which may be repeated twice or more, with the interpoſition of two days between each doſe, and at night an ounce of diacodium.

On the days in which purging is omitted, let the patient take four ounces, three or four times in a day, of the emulſion of the four greater cold ſeeds, and white poppy ſeeds.

If the diſeaſe will not yield to repeated cathartics and bleeding, give an ounce of diacodium every night.

The ſlighter caſes may be cured without bleeding; but if any degree of a fever is joined, or the inflammation is conſiderable, this evacuation is never to be omitted. The more violent inflammations are not to be cured without larger bleedings, unleſs we can make a derivation from the part affected without draining the whole body. For this purpoſe bliſters are uſefully applied behind the ears, eſpecially if they are to lie on for two or three days, and if the ſores are afterwards kept running. Two leeches ſhould be applied to the lower part of the orbit, or near the external angle of the eye, and the wounds be allowed to ooze for ſome hours after they are fallen off.

This method will likewiſe do in ophthalmias from external injuries; but not when they proceed from a ſcrophulous or venereal cauſe. In bad caſes, after the inflammation has yielded a little to evacuations, the coagulum aluminoſum, ſpread on lint, and applied at bed-time, is the beſt external remedy.

In the mean while, bliſters muſt be applied to the neck, and kept running for ſome days; and after that, ſetons, or iſſues at leaſt. It is hard to ſay, of what vaſt advantage bliſters and ſetons are in this diſeaſe.

The expreſſed juice of millepedes may alſo be given [25 are a doſe] on the days purging is omitted, in four ounces of beer, or Rheniſh or French white-wine: let them ſtand, when mixt, all night; and then take it with a little ſugar in the morning, after the mixture is drained.

But according to the later experience of Dr Fordyce, Fothergill, and others, a ſtrumous opthalmia may be certainly and ſafely cured by half a dram of the bark given twice a-day.

The length of time in which the bark is to be taken is uncertain, for in ſome the cure is performed in leſs time than others.

Hoffman, beſides bliſters, ſetons, *&c.* recommends cupping, with ſcarification, in the nape of the neck, and behind the ears; and in the violent ſort of this diſeaſe, bleeding in the jugular; as alſo ſinapiſms of rocket-ſeeds boiled in wine, and then put into ſmall bags and applied to the nape of the neck or under the armpits. For inward uſe, he prefers to all other remedies, an infuſion, in the manner of tea, of valerian-root, liquorice, elder-flowers and fennel-ſeeds, drank plentifully; and before the

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the drinking of it to receive the vapour or ſteam into the eyes.

Of the Apoplexy.

This diſeaſe is a ſudden abolition of all the ſenſes, external and internal, and off all voluntary motion, commonly attended with a ſtrong pulſe, laborious breathing, a deep ſleep, and ſnorting.

There is no difference between a perſon aſleep and in an apoplexy, but that the one can be awaked, and the other cannot.

The cauſes of this diſeaſe are a particular conformation of the body, as a ſhort neck, for ſome have fewer vertebræ in their necks than others; a groſs, plethoric, fat, phlegmatic conſtitution; polypous concretions in the carotid and vertebral arteries, or about the heart, or within the ſkull, which are known by an unequal pulſe, a vertigo, and ſometimes a momentary loſs of ſight; an inflammatory thickneſs of the blood, preceded by a fever attended by the head-ach, redneſs of the face and eyes, an advanced age, attended with a glutinous, cold, catarrhous, leucophlegmatic conſtitution.

The forerunners of an apoplexy in theſe laſt, are, dulneſs, inactivity, drowſineſs, ſleepineſs, ſlowneſs of ſpeech and in giving anſwers, vertigoes, tremblings, oppreſſions in ſleep, night mares; weak, watery, and turgid eyes; pituitous vomiting, and laborious breathing on the leaſt motion.

Other cauſes may be, whatever compreſſes the veſſels of the brain; as, a plethora, a cacochymy, attended with fulneſs of the veſſels; a hot conſtitution; tumors within the ſkull; the velocity of the blood increaſed towards the head, and diminiſhed downwards; compreſſion of the veins without the ſkull, which bring the blood back from the brain; the effuſion of any fluid compreſſing the dura and pia mater externally; the effuſion of any fluid within the brain, which by its preſſure hurts the origin of the nerves; this is the moſt common cauſe of apoplexies, and proceeds from blood in the plethorical, from a ſharp ſerum in the hydropical and leucophlegmatical, and from an atrabilious acrimony in the melancholic, the ſcorbutic, and the podagric. Violent paſſions of the mind, and intenſe ſtudy, are prejudicial to theſe.

There are three degrees of an apoplexy. The firſt is, when the vital fluids are, by the force of violent diſtentions, driven from the lower and outward parts of the body, to the external parts of the head, and to the brain and its meninges, by the carotid arteries; whereby their veſſels are expanded, and the free circulation through them impeded. While this ſtagnation of the blood continues, the external and internal ſenſes are aboliſhed; and as the ſtoppage goes off they are gradually reſtored. Such are the fits that hypochondriacal and hyſterical perſons are ſubject to.

The ſecond degree is, when the ſtagnation continues ſo long that the ſerum oozes through the veſſels, and falls upon the ſides of the medulla oblongata or ſpinalis, and ſo ſtops the influx of the nervous fluid, and produces a hemiplexia or a palſy.

The higheſt degree is, when the fine veſſels of the pia mater are broke, and the extravaſated blood occupies the baſis of the brain.

The firſt may be cured by timely bleeding: the ſecond, though it does not ſuddenly kill, yet it generally renders the patient infirm ever after: the third is almoſt always mortal.

The immediate forerunners of an apoplexy, are trembling, ſtaggering, a giddineſs in the head, a vertigo, dimneſs of ſight, a ſtupor, ſleepineſs, forgetfulneſs, noiſe in the ears, more deep and laborious breathing, the nightmare.

A ſlight apoplexy goes of in a profuſe, equal, roſcid, warm ſweat; a large quantity of thick urine, by the bleeding piles, the flowing of the menſes, a diarrhœa, or a fever. If it is more ſevere, it uſually terminates in a paralytic diſorder; and is ſeldom curable, but always leaves behind it a great defect of memory, judgment, and motion.

Bleed in the arm to 12 ounces, and then in the jugular to 7 ounces; immediately after which, give an ounce and a half, or two ounces, of emetic wine.

Apply a large ſtrong bliſter to the neck, hold the patient upright in bed, and let the ſpirit of ſal ammoniac, highly rectified, be held to his noſe.

Let there be ſtrong frictions of the head, feet, and hands; and let the patient be carried upright backwards and forewards about the room, by two ſtrong men. Strong bliſters ſhould be applied to the head, neck, back, and calves of the legs. Sharp clyſters ſhould be thrown up into the body, which have a tendency to excite the patient, and to cauſe a revulſion.

Shaw adviſes, during the fit, to bleed largely in the arm, or rather in the jugular, to apply ſtrong volatiles to the noſe, to blow ſneezing powders up the noſe, as alſo to rub the temples with ſpirituous cephalic mixtures.

Likewiſe to blow in the mouth and noſtrils the ſmoke of tobacco from an inverted pipe.

Thoſe who have once had a fit of the apoplexy, are very liable to be ſeized with it again; and if they are plethoric, the beſt preſervative is bleeding once in three months, and uſing themſelves to a ſpare diet; taking medicines which ſtrengthen gently, and abſtaining from cares and all intenſe applications of the mind; not neglecting iſſues and ſetons, nor the drinking ſuitable mineral waters.

Of the Palsy.

A Palsy is a lax immobility of any muſcle, not to be overcome by the will of the patient. Sometimes the ſenſation of the part is abſolutely aboliſhed, and ſometimes there remains a dull ſenſe of feeling, with a kind of tingling therein.

It may be cauſed by all things that bring on an apoplexy; that render the nerves unfit to tranſmit the animal ſpirits; that hinder the entrance of the arterial blood into the muſcle. Hence the nature of a paraplegia or hemiplegia, and the palſy of a particular part, may be underſtood

Hence a palſy may proceed from an apoplexy, an epilepſy, extreme and laſting pains, ſuppreſſions of the uſual

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evacuations, tranſlations of the morbific matter in acute diſtempers; whatever diſtends, diſtorts, compreſſes or contracts the nerves, ſtrong ligatures, luxations, fractures, wounds, gangrenes, inflammatory and other tumors of the coats of the nerves, in the ganglia, or the nerves themſelves; extreme heat, violent cold, mineral effluvia, and the too frequent uſe of hot water.

Palſies of the heart, lungs, and muſcles ſerving for reſpiration, are ſoon fatal; of the ſtomach, bowels and bladder, from internal cauſes, very dangerous; of the face is bad, and eaſily changes to an apoplexy.

If the part is cold, inſenſible, and waſtes away, it ſeldom admits a cure; if attended with a violent convulſion and great heat of the oppoſite part, it is very bad.

The regimen in this diſeaſe ought to be warm and attenuating, conſiſting of ſpicy and cephalic vegetables, ſuch as create a feveriſh heat, becauſe it is neceſſary to diſpel the viſcoſity. Soapy vegetables are beſt, and ſuch as conſiſt of an acrid volatile ſalt, and oil, muſtard, horſe-radiſh, *&c.* ſtimulating by vomits; ſneezing; relaxing the belly; promoting ſweat by ſuch motions as can be uſed, or other means; by ſtrong friction, *&c.*

The cure of the palſy is to be attempted by attenuants and diſcutients; ſuch as, aromatic, cephalic, nervous and uterine vegetables; their fixed and volatile ſalts; as alſo by their oils; ſoaps made of their oils and ſalts; the ſtrong ſcented parts of animals; the juices, ſpirits, oils, and tinctures of inſects; foſſile ſalts, metallic cryſtals, and medicines compounded of theſe.

Likewiſe by things which ſtimulate ſtrongly, and which, by exciting a tremulous and convulſive motion of the nerves, drive out the impacted matter; to this claſs, ſternutatories and emetics chiefly belong, eſpecially if often uſed at firſt.

By purging with warm, opening, aromatic vegetables, with acrid foſſils, with mercurial and antimonial preparations, in a large doſe, and repeated ſucceſſively for ſeveral days, by the means of which a copious and laſting diarrhœa may be excited.

By filling the veſſels of the body with drinking a large quantity of the attenuants above mentioned, and then by exciting a greater motion and ſweat by the vapours of ſpirits ſet on fire.

Outwardly, frictions may be uſed, either dry and hot, till the part is red; or with ſpirits endued with a ſtimulating virtue; or with nervous oils, liniments, balſams, or ointments; vapour or immerſive baths; acrid, aromatic, and drawing plaiſters; cupping, ſcarifications, bliſters; whipping the part with rods; exciting a ſlight inflammation with nettles, and the like.

A courſe of electrification for ſome weeks has been known to have cured ſome inveterate palſies, though it hath failed in others. See ELECTRICITY.

Of the EPILEPSY, *or* FALLING SICKNESS.

SOMETIMES this diſeaſe comes on ſuddenly and unawares; but it oftner gives notice of its acceſſion by ſome preceding ſymptoms; the chief of which are, a laſſitude of the whole body, a heavy pain of the head with ſome diſturbance of the ſenſes, unquiet ſleep, unuſual dread, dimneſs of ſight, a noiſe in the ears: in ſome there is a violent palpitation of the heart, a puffing or inflammation of the præcordia, a ſtopping of reſpiration, a murmuring noiſe in the belly, fœtid ſtools, a flux of urine, a refrigeration of the joints: in others, there is a ſenſe, as it were, of a cold air aſcending from the extreme parts to the heart and brain.

Then they fall ſuddenly on the ground, (whence the name of the falling ſickneſs;) the thumbs are ſhut up cloſe in the palms of the hands, and are with difficulty taken out; the eyes are diſtorted or inverted, ſo as nothing but the whites appear; all ſenſation is ſuſpended, inſomuch that by no ſmell, no noiſe, nor even by pinching the body, can they be brought to themſelves; they froth at the mouth with a hiſſing kind of a noiſe, the tongue is lacerated by the teeth, and there is a ſhaking or trembling of the joints.

However, the convulſions vary, as well as the defect of the ſenſes, both in degree and kind, for ſometimes, inſtead of convulſive motions, the limbs are all ſtiff, and the patient is as immoveable as a ſtatue. In infants the penis is erected; in young men there is an emiſſion of ſemen, and the urine very often ſtreams out to a great diſtance.

At length there is a remiſſion of the ſymptoms, and the patients come to themſelves after a longer or ſhorter interval; then they complain of a pain, torpor and heavineſs of the head, and a laſſitude of all their joints.

Theſe fits are more frequent or ſeldom, or longer or ſhorter, according to their different cauſes. Some return on certain days or hours, or even months, according to the quadratures of the moon, but eſpecially about the new or full moon; in women, chiefly about the time of menſtruation; and what is moſt remarkable, often upon a very ſlight occaſion; for inſtance, any ſudden perturbation of the mind, as a fright, anger, ſudden joy, intenſe application, ſtrong liquors, exceſſive heat or cold, or venereal exerciſes

As to the prognoſtics; in boys, this diſeaſe terminates about the ſeventh, the fourteenth, or the ſeventeenth year, that is, about the time of puberty; in women, about the fourteenth, *viz.* the time of menſtruation. Likewiſe it has been found by experience, that chronical epilepſies have ſpontaneouſly ceaſed by the change of place, diet, and way of life. Sometimes a quartan ague will put an end to an epilepſy and convulſion-fits. It is alſo remarkable, that the itch, or any other cutaneous diſtemper, ſuch as the ſmall pox, meaſles, miliary eruptions, *&c.* will either abate the violence, or quite ſtifle this diſeaſe.

The patient therefore need not deſpair of a cure, if the diſeaſe is not of long ſtanding, the fits ſhort, the diſorder not hereditary, and the years advancing to the time of puberty; or if it proceeds from a fault in the *primæ viæ*, from worms, from a bad regimen, or from a ſubcutaneous diſeaſe ill cured. Nor is the caſe deſperate if the epilepſy be ſlight, and when the fit is foreſeen by a ſenſation of cold air, ariſing from the extreme parts to the back, præcordia, and head, and alſo when it is uſhered in by anxiety, by want of ſtrength, and a propenſity to vomit; or when the ſenſes are not quite aboliſhed in the time of the fit, or when it comes on in the night, without the incurvation of the thumbs.

It

It is a bad ſign if the epilepſy makes its firſt attack after the twenty firſt year, but much worſe if the fits grow more frequent; for then the animal functions are often deſtroyed, and not only the memory, wit, and judgment are impaired, but the patient grows ſtupid and fooliſh. It ſometimes ends in melancholy or madneſs. When it turns to a palſy or apoplexy, it is mortal.

The epilepſy is extremely difficult to be cured in adults, but in children it is the reverſe. Bliſters laid to the back part of the head are of great uſe a little before the paroxyſm is expected: and the time may more certainly be foreknown, as this diſeaſe is influenced by the moon, and attends upon its phaſes, eſpecially the new or full moon. The moſt proper medicines to correct the juices ſeem to be native cinnabar, and wild valerian root; a dram of which may be given morning and evening for three or four months, and afterwards two or three days before the new and full.

However, it muſt not be forgot, that this diſeaſe owes its origin to ſo many different cauſes, and is bred in ſo many different conſtitutions of the body, and the ſame remedy which ſucceeds in one caſe often fails in another; and therefore different medicines are to be tried, eſpecially on adults. And great regard muſt be had to the times in which the paroxyſms uſually return, in order to effect a cure.

If the veſſels are full of blood, or it is carried with too great an impetuoſity towards the head, then bleeding in the ankles will be proper, or leeches applied to the hæmorrhoidal veins. This often happens to hypochondriacal or hyſterical perſons, to the melancholic, and women with child. Sometimes it will be proper to bleed in the jugulars; or to apply cupping-glaſſes with ſcarifications to the neck, and parts near the head.

It has its origin from a ſharp, impure ſerum in the head, or in the membranes and veſſels, as in cachectical or ſcorbutical perſons, or thoſe who have been inconſiderately cured of œdematous ſwellings of the feet, old ulcers, or iſſues dried up; the driving in of the itch, ſcabs, or the ulcerating humour of a ſcald head; then the cure may be attempted by cathartics, by purifiers of the blood, by evacuating the impure humours with ſetons, iſſues, cauteries, and bliſters.

If it proceeds from violent pain, as for inſtance, from a ſtone ſticking in the ureter, from the tooth-ach, ear-ach, or ſpaſms of the ſtomach and bowels; then clyſters of oil of ſweet almonds, or the like, are to be adminiſtered.

If, in children, it proceeds from gripes, or the breeding of teeth, nothing is better than to cleanſe the *primæ viæ* from filth, by milk-clyſters, with a little venice ſoap diſſolved in them.

If from worms, after antiſeptics and ſoft oily things, anthelmintics muſt be given, ſuch as tanſey, garlick, camphor, aſa fetida, worm-ſeed, mercurius dulcis, and ethiops mineral, or powder of tin.

When the fits return at certain periods, or at the quadratures of the moon, a clyſter or a vomit will be proper firſt of all, of half a dram of ipecuanha, in a decoction of raiſins.

In the time of the fits, too free a uſe of volatiles, ſpiritous liquors, and ſtrong ſmells, are hurtful, as cauſing the humours to flow too much to the head: The beſt method is to place the patient in an erect poſture, and to rub the hands and feet pretty briſkly.

The beſt drink is water, which will mitigate, if not cure the ſymptoms.

When the patient is ſo happy as to foreſee the acceſſion of the fit, then let him have immediate recourſe to clyſters and frictions of the lower parts.

A milk-diet alone has cured an inveterate epilepſy. Miſleto is ſaid to cure an epilepſy as ſure as the bark an intermitting fever. The doſe to grown perſons is half a dram or more, in powder, every ſixth hour, drinking after it a draught of a ſtrong infuſion of the ſame plant. If to every ounce of the powder, a dram of aſa-fetida be added, the medicine will be ſtill more effectual.

Cinnabar of antimony is greatly celebrated for the cure of this diſeaſe; and may be taken from four grains to a ſcruple, in conſerve of roſemary flowers.

Ferreus and Jachinus affirm, they have cured many epilepſies with a ſimple decoction of guaiacum, giving ſix or eight ounces of it twice a-day, and the ſecondary decoction of the ſame for their ordinary drink. This decoction ſhould be continued 30 or 40 days, to which may be added male piony root, or ſomething of the ſame kind; and every doſe may have a few drops of the ſpirit of vitriol added thereto.

After all, there is no medicine that can be depended more upon than MUSK; for it is an excellent remedy in all diſeaſes of the nerves, particularly cramps, convulſions, vertigoes, and epilepſies. Ten grains may be taken morning and night, made up into a bolus; if the ſame quantity of factitious cinnabar be added to each doſe, it will not be the worſe.

Of St VITUS's DANCE, *and other convulſive diſorders.*

ST VITUS's dance is a ſort of a convulſion, which boys and girls are ſometimes ſubject to, from the age of ten years, to the time of puberty. It diſcovers itſelf firſt by a kind of lameneſs, or an inſtability of one of the legs, which they draw after them in a ridiculous manner, nor can they hold the arm of the ſame ſide ſtill for a moment; for if they lay it on their breaſt, or any other part of their body, it is preſently forced away from thence by a convulſive motion. If they are deſirous of drinking, before they can bring the cup to their mouth, they uſe a thouſand odd geſticulations like a mountebank; for they cannot bring their hand in a direct line to their mouth, but it is forced this way and that, till at length, if they have the good fortune to hit the mark, they throw the liquor down their throat as greedily as if they deſigned to raiſe laughter in the ſpectators.

In a convulſive paroxyſm, the limbs are ſtrangely agitated with various different poſtures and motions. Sometimes the hands are put behind them as if they deſigned to ſit upon them, and ſoon after they ſeem to be beating the air; then their legs will be drawn hither and thither as if they were dancing ſome antic dance. Sometimes they will bend their backs like a bow, at the ſame time raiſing their breaſt as high as they can; then their whole body will grow ſtiff, and as immoveable as a ſtone. They generally

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generally keep on their legs without falling; yet ſome will grovel on the earth like epileptic perſons, and will weep, laugh, gnaſh their teeth, gape with their mouths, put out their tongues, roll their eyes, and whirl their heads about in a ſtrange manner.

After the fit, ſome are inexpreſſibly weak; ſome faint away, others fall into a deep ſleep; in others, again, the fit is terminated with eructations, wind, vomiting, and throwing out plenty of water. Very often a mucus diſtils from the noſe, or blood iſſues from thence, or from the uterus or hæmorrhoidal veins.

Theſe perſons have generally unquiet ſleep, and full of dread and terror, an uncertain appetite, their bodies generally a little coſtive; they ſweat with difficulty, but are ſubject to great paſſions of the mind. The acceſſions of the fits keep exact pace with the phaſes of the moon. In women they precede or accompany the eruption of the menſes. They are moſt frequent and worſt after meals; and are eaſily excited by the paſſions of the mind.

The fits are generally preceded with a coldneſs of the feet and limbs, or a kind of tingling ſenſation; which alſo affects the os coccygis, and like cold air aſcends up the ſpinal marrow; there is a diſtended flatulent pain in the left hypochondrium, and ſuch a conſtipation of the body that neither wind nor excrements can make their exit, nor will the anus admit a clyſter-pipe, or, if it does, the clyſter and excrements are thrown up by vomit. The bladder is likewiſe ſo affected, that no urine can be made, or at leaſt but little, and thin and white. In others, the acceſſion begins with yawning, ſtretching, anxiety about the heart; a hard unequal contracted pulſe, the heart-burn, naufea, vomiting, palpitations of the heart, difficulty of ſwallowing, pain of the head and teeth, noiſe in the ears, giddineſs, *&c.* and then come on the convulſions.

Though this is a terrible diſeaſe, it never kills ſuddenly. When it is recent, the perſon young, and otherwiſe of a good conſtitution, there is the greateſt hopes of a ſpeedy cure. If uſual evacuations of blood by the uterus or hæmorrhoids are ſuppreſſed, the return will either mitigate or cure the diſeaſe. On the contrary, if the humours are thick and impure, the ſuppreſſion obſtinate, their temperament inclining to great ſenſibility, the age advanced, or the diſeaſe hereditary, or become habitual, the cure is difficult. Sometimes, through ill management, it degenerates into an epilepſy or hypochondriac melancholy.

To cure the St. Vitus's dance, take away about 8 ounces of blood, more or leſs, according to the age of the patient; the next day give half, or ſomething more of the common purging potion according to the age, and in the evening the following draught:

Take an ounce and a half of alexeterial water; 30 drops of compound ſpirit of lavender; a ſcuple of theriaca andromachi; and 8 drops of the tinctura thebaica. Mix and make them into a draught.

Let the cathartic potion be repeated thrice every other day, and the ſame draught in the evening. After which, bleed again, and repeat the cathartics three or four times; and this courſe may be purſued to the third or fourth time.

Apply to the ſoles of the feet *emplaſtrum e caranna*. For fear of a relapſe, at the ſame ſeaſon of the next year, or a little ſooner, in which the diſtemper appeared, bleeding ſhould be again repeated, and purging two or three times.

Allen cured two girls of this diſtemper with the expreſſion of millipedes and the Peruvian bark, after bleeding and a gentle cathartic.

As to the cure of other convulſive diſorders, if the patient is plethoric, or the pulſe great, it muſt be begun with bleeding either in the arm or foot; and if occaſion require, it muſt be repeated two or three times, but not till the fit is over. The air ſhould be dry and ſerene, with conſtant exerciſe; the aliment ſhould be eaſy of digeſtion, and all hot ſpirituous liquors ſhould be avoided. The conſtant drink ſhould be the decoction of ſcorzonera roots, with ſhavings of hartſhorn, or whey, or the Selter's mineral waters. *Pediluvia* are likewiſe proper, of river-water, wheat-bran, and chamomile-flowers. They ſhould be uſed pretty warm and deep, at the time of going to bed, and afterwards ſweating ſhould be promoted.

The patient's body, if coſtive, muſt be kept open with manna, or with oily clyſters; and if the *fomes* of the diſeaſe is judged to be in the *primæ viæ*, it will be proper, at the changes of the moon, to give a vomit with manna, that is, an ounce of manna with two or three grains of tartar emetic.

If, about the time of puberty, this diſeaſe proceeds from too early or exceſſive coition, or violent paſſions of the mind, all things which cauſe a commotion in the fluids muſt be avoided; ſuch as, aromatics, ſharp purges, emetics, ſpirituous liquors, inordinate motions of the body or mind, and all heating things in general. On the contrary, the diet ſhould be ſoft, emollient, and nouriſhing; ſuch as cow's or aſs's milk, or whey; as alſo baths of ſweet water mixed with milk. Likewiſe jellies, and decoctions of ſcorzonera, barley, hartſhorn, ivory ſhavings, and viper's fleſh, for ordinary drink, and chocolate.

If it proceeds from worms, the cure depends on their being killed and expelled out of the body: But all anthelmintics, or worm medicines, are not to be made uſe of in this caſe; ſuch as garlick, vitriol, copper, aloes, ſharp purges, and mercurials; becauſe, if they are given inconſiderately, they are hurtful to the nerves. It will be better to uſe clyſters, made of milk, ſweet things, and oil; as alſo liniments of a purging quality applied to the navel and abdomen. Inwardly may be taken *ſemen ſantonici*. If mercurius dulcis is given with a cathartic, it will be neceſſary firſt of all to let the patient take a few ſpoonfuls of oil of ſweet almonds.

If it is cauſed by a ſuppreſſion of the menſes, emmenagogues and hot medicines are to be forborne; but bath-waters and bleeding will be proper; as alſo *pediluvia*, if made pretty warm; hot infuſions of balm-flowers, and flowers of the lime-tree, tincture of caſtor, abſorbent powders, antiſpaſmodics, and anodynes.

If from a ſtoppage of the hæmorrhoidal flux, beſides bleeding and the above remedies, leeches applied to the anus will be of very great advantage.

In the obſervations of the medical ſociety of London, we have an account of a deplorable convulſive caſe being cured by electricity.

Of

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Of the Convulsive Asthma.

An aſthma is an impeded and very laborious reſpiration, attended with unſpeakable anxiety, and a ſtraitneſs about the præcordia, hindering the free circulation of the blood through the lungs, ariſing from variety of cauſes, and not without danger of ſuffocation.

There are ſeveral ſorts of aſthmas. One is, difficulty of breathing, proceeding from corpulency and a very full habit of body; and is moſt apparent after violent motion: but this is a ſlight diſorder, and free from all danger. The next is the pituitous aſthma, attended with a moiſt cough, and the bringing up pituitous matter; it attacks the patient at all hours, and in all poſitions of the body, and is owing to a plenty of a viſcid mucus, ſtuffing the veſiculæ of the lungs, and hindering the free ingreſs and egreſs of the air through them. Another is owing to the convulſive contraction of the parts deſigned for reſpiration, and proceeds from various cauſes both within and without the thorax; and this is called the dry flatulent or convulſive aſthma.

There is a heavineſs of the breaſt, a ſlowneſs to perform cuſtomary labours, difficult breathing when going up a hill; the patients grow hoarſe, cough, and are troubled with frequent eructations; they cannot ſleep, and are ſcarcely warm in their beds. As the diſeaſe grows worſe, the cheeks look red, the eyes grow prominent as if they were ſtrangled; they ſnore or wheeze while waking, but much more when aſleep; they are fond of cold air, they keep themſelves in an erect poſture, and ſeem to ſuck in the air with open mouth: they are troubled with ſweating about the neck and forehead; then comes on a violent cough, and the patient brings up a little cold frothy matter. As they draw in their breath, the neck ſwells, and the præcordia are pulled upwards; the pulſe is ſmall and quick. If it increaſes, the patient is in danger of ſuffocation: but if it grows better, the fits are ſeldom, and greater plenty of matter is coughed up; the urine is more plentiful, but without a ſediment; the voice grows clearer, the ſleeps longer than are neceſſary, the præcordia are ſet at liberty; a pain ſometimes paſſes to the ſhoulders; the breathing is ſlow and gentle, but with a ſort of a wheezing.

The longer this diſeaſe continues, the more ſharp and violent all the ſymptoms become. The patient's body grows more coſtive, and the urine is thin and watry; moſt commonly the feet ſwell, then the hands, face and back; there is a numbneſs of the arms, the countenance is wan and livid, or of a leaden colour. Then comes on a little fever, which grows worſe in the evening; the whole body is cachectic, with an œdematous ſwelling of the feet; there is a dropſy of the breaſt, or an aſcites, or anaſarca; at leaſt there is a palſy on one ſide, or of the arm; or, inſtead, thereof a palſy of the eyelids.

When the diſeaſe is recent, and is owing only to the ſpaſmodic contraction of the præcordia, there are hopes of a cure; eſpecially if the matter of the gout, ulcers, and exanthemata, are ſent back to their proper ſeats. When the menſes or hæmorrhoids which were ſtopped return, it yields relief, and, if the diſeaſe was not too far advanced, perfect health. If it is inveterate, or ill managed, it brings on a dropſy of the breaſt, obſtructions of the lower belly, œdematous ſwellings of the feet, a cachexy, and an univerſal dropſy. In general, all convulſive aſthmas portend a ſudden exit, or ſuffocation, eſpecially if there is a polypus of the heart: if it continues long, then the patient will die of the dropſy; in which caſe it will be ſoon fatal; when there is a ſlow fever, an unequal intermitting pulſe, a palſy of the arms, a continual palpitation of the heat, little urine, a ſyncope or ſwooning, then death is at hand. Some are carried off by an inflammation of the lungs, and the more grievous the diſeaſe the more languid the pulſe. The aſthma, in old perſons, continues till death.

In the paroxyſm, becauſe the body is generally bound, and the wind and humours are carried upwards, the ſpeedieſt aſſiſtance is from emollient and carminative clyſters.

Afterwards uſe frictions of the feet, which have an incredible efficacy; alſo let them be put into warm water; for the feet are almoſt always cold. When there is a violent ſpaſm about the præcordia, hot fomentations are neceſſary, or bladders filled with hot milk, and applied to the part affected; likewiſe nervous liniments are very uſeful, rubbed in with a warm hand.

Internally, antiſpaſmodics ſhould be given, with gentle diaphoretics.

And this is all that needs to be adminiſtered in the fit.

Out of the fit, if it proceeds from too great a congeſtion of blood about the breaſt, or from a polypus of the heart, bleeding in the foot will be proper, as alſo ſcarifications; in a ſuppreſſion of the hæmorrhoids, leeches ſhould be applied to the anus; alſo gentle laxatives to cleanſe the *primæ viæ*; likewiſe bodily motion, ſlender diet, and ſoft drink. If there are hypochondriacal or flatulent ſymptoms, then gentle laxatives will be the more neceſſary, together with clyſters. When the menſes or hæmorrhoids are ſuppreſſed, nothing is better than the bath-waters, both for bathing and drinking; or the waters of Selters taken warm and mixed with milk.

When the aſthma proceeds from the driving back ſome impure matter from the ſkin, or from the drying up of ulcers, and the humour is tranſlated to the nervous parts of the breaſt, then gentle diaphoretics will be neceſſary to ſend it back to the ſuperficies of the body.

After which the patient may drink tea made of balm, or elder, or lime tree flowers, with the leaves of ſcordium, or veronica and fennel ſeeds, or any thing elſe of the ſame kind. Remedies compounded of ſulphur are likewiſe very efficacious in driving back the morbific matter to the ſkin, though outwardly they are hurtful in cutaneous diſeaſes.

The returns of the fits are to be obſerved and guarded againſt, by moderate evacuations, as bleeding, gentle vomits, laxatives, and ſometimes cathartics: but every thing that heats the blood ſhould be carefully avoided, eſpecially about the uſual times of the paroxyſms; becauſe there is generally then a lurking fever, which ought not to be exaſperated by heating food or medicines.

In a dry aſthma proceeding from fumes of lead, an air replete with exhalations from quick lime, or the vapours of pitcoal; milk, cream, oil of ſweet almonds, emulſions

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of ſperma ceti, the fat of animals uſed internally and externally, anſwer every purpoſe.

Country air, and following the plough, are beneficial to reſtore the debilitated tone of the lungs; and tea, made with hyſſop, veronica, ground-ivy, liquorice, and daiſy flowers, cannot be enough commended. But ſweet things, in every kind of aſthma, are hurtful, eſpecially in the humid or ſerous, and the hypochondriacal.

Of a Cough.

The cough now under conſideration is a primary diſeaſe, which greatly diſorders the whole body by its vehemence and obſtinacy. Its cauſe is, a flux of ſerous humours from the outward parts and extremities of the body to the lungs, and is ſeldom without feveriſh heats and ſhiverings towards the evening.

It is either moiſt or dry: the former afflicts the phlegmatic, whoſe fibres are lax and muſcles ſoft, and who abound with ſerous and pituitous humours. Women are more liable to it than men; as alſo infants, boys, and old men, more than thoſe in the vigour of their age. The dry cough principally attacks the hypochondriac, the ſcorbutic, the cachectic, and thoſe who are lean and ſlender, and ſubject to convulſive diſorders, and whoſe bodies likewiſe abound with a ſharp ſerum.

The moſt violent of theſe kind of coughs is the *tuſſis convulſiva*, or *ferina*, whoſe effects are ſo violent as almoſt to put the patient in danger of ſuffocation: In children, this is called the hooping cough. Sometimes this is dry in the beginning; or the patient brings up a little thin ſerum, more or leſs ſharp. Sometimes it is moiſt; and then after a very laborious fit, the patient expectorates a ſublivid, and commonly a moſt tough mucus. The extreme parts grow cold, the body is coſtive, the urine and the vital fluids are driven in greater plenty and force towards the breaſt and head; ſo that while the paroxyſm laſts, the face is red and turgid with blood, the veins ſwell, the arteries beat quicker and ſtronger, the eyes are ready to ſtart out of the head, the tears flow, the eyelids ſwell, and ſometimes the blood, after ſneezing, ſprings from the noſe. Sometimes the very veſſels of the lungs burſt, and a ſpitting of blood enſues. Sometimes a hiccup ſupervenes, and then at the ſame time the patient is affected with laborious vomiting; ſome diſcharge their excrements and urine inſenſibly; and the coughing of others is ſo violent as to cauſe ruptures, eſpecially in children.

As to the prognoſtics, a dry cough often turns to a moiſt, by hurting the digeſtion, and rendering the patient cachectic. When a moiſt cough becomes ſuddenly dry, and the breaſt remains oppreſſed, we may conclude that a putrid or hectic fever, or an exulceration of the lungs, are near at hand. In the convulſive cough of children there is danger of a ſuffocation; which cough ſometimes happens in difficult dentition, and in the meaſles. It ſometimes cauſes gibboſity and ruptures in boys; in women abortion; in adults a ſpitting of blood and a phthiſis. Coughs that proceed from a ſchirrus of the lungs or other viſcera, are incurable; if from driving in of exanthemata, or breakings out of the ſkin, it grows eaſy as ſoon as they are thrown out again. All coughs attended with loſs of ſleep are bad; as alſo that which is frequent, tedious, obſtinate, and proceeds from a defluction on the lungs. On the contary, a moderate heat in the night time, with an equal breathing ſweat throughout the whole body, a larger flux of urine, and the body open at the ſame time, a more quiet ſleep, and an eaſier expectoration, are certain ſigns that the diſorder is going off.

If the cough is recent, and there is no fever, nor other ſigns of a baſtard peripneumony; or if it is not the conſequence of a pleuriſy or a peripneumony ill cured, by a neglect of ſufficient bleeding; the patient need only abſtain from wine and fleſh for ſome days, and uſe the following remedy.

1. Take 10 drops of balſam of ſulphur, with a bit of candied ſugar; to be uſed twice or thrice in the day.

Recent coughs, after bleeding, are ſoftened by a mucilage of linſeed, or by any common ſweet oil: But the oils are made more efficacious by the addition of a volatile alkaline ſalt, in this manner:

2. Take an ounce and a half of oil of olives, 6 ounces of water, 60 drops of ſpirit of hartſhorn, an ounce of pectoral ſyrup: Take three or four ſpoonfuls every fourth hour.

If the cough will not yield to theſe remedies, then it will be to no purpoſe to rely on pectorals, eſpecially if there is a fever along with it, or if it proceeds from a pleuriſy or peripneumony; for then it is to be cured by bleeding and purging, in the ſame manner as the baſtard peripneumony.

When there is a thin, ſalt, ſharp defluxion, jellies are proper, and a decoction made of barley, ſhavings of hartſhorn, viper-graſs root, and liquorice; or the decoction of turpentine with ſugar; and above all things, oil of ſweet almonds freſh drawn.

When a tuſſis catarrhalis affects the whole habit or body, with a loſs of appetite and a tabes, the cure muſt be attempted with aſſes milk or whey, or milk with equal parts of Selters waters, and eſpecially riding.

In a moiſt, laſting, pituitous cough, the body muſt be kept open with manna, two ounces at leaſt diſſolved in any convenient vehicle, to which may be added, two drams of terra foliata tartari, and a few drops of oil of aniſeed. If the ſtomach will not bear laxatives, clyſters muſt be uſed.

When the cough is outrageous, ſaffron mixed with bezoardics is very friendly to the breaſt; nor are ſtorax pills, mixed with the aromatic pills, leſs beneficial. You may order about 6 grains of the ſtorax pills, with a ſcruple of the aromatic, and give them at bed-time; in the mean while not neglecting the expectorants, oil of ſweet almonds, and ſperma ceti. Likewiſe the thebaic tincture mixt with ſpirit of hartſhorn is not unuſeful for the ſame purpoſe.

But the beſt opiate in this caſe, is the elixir paregoricum: the doſe for children is from 5 to 20 drops; for adults, from 20 to 100 and upwards. It is peculiarly excellent for children in the hooping-cough or chin-cough.

The patient ſhould, as much as poſſible, breathe a temperate air, ſhunning all ſalted and ſmoak-dried meats, poignant

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poignant ſauces, for they render the blood and ſerum ſharp and impure; he ſhould alſo abſtain from malt liquors, but more eſpecially acid wines. The drink ſhould be hydromel; or, if the patient is ſcorbutic, water alone, the cold being firſt taken off with toaſted bread. The vulgar pour hot water upon wheat bran, and drink the infuſion cold, not without ſucceſs.

As to bleeding in this diſeaſe, it is neceſſary for thoſe who are full of blood, and whoſe veins are very prominent; or when the uſual excretions of it are ſuppreſſed; it is alſo a good preſervative, though the perſon has paſt his ſeventieth year. Bliſters may likewiſe be uſed, in obſtinate caſes.

Of a PHTHISIS, *or Conſumption of the* LUNGS.

IF an ulcer of the lungs conſumes them ſo far that the whole habit of body waſtes away, it is called a conſumption of the lungs.

This ulcer may proceed from any caſe which may detain the blood in the lungs ſo as to change it into a purulent matter.

The cauſes may be referred.

I. To that temperament of the body which tends firſt to ſpitting of blood, then to an ulcer of the part where the blood has made its way through. This conſiſts,

In a tenderneſs of the arterial veſſels, and in the impetus of a more or leſs acrimonious blood. This is known from a view of the tender and fine veſſels, and of the ſlender make of the whole body, a long neck, a flat and narrow thorax, depreſſed ſcapulæ; the blood of a bright red, thin, ſharp, and hot; the ſkin tranſparent, very white and fair, with a blooming red in the cheeks; the wit quick, ſubtle, and early ripe with regard to the age, and a merry chearful diſpoſition.

In ſuch a debility of the viſcera as diſpoſes their too tenacious contents to produce obſtructions, putrefactions, and to grow acrimonious, whereby the veſſels are corroded, firſt cauſing ſpitting of blood, and then ulcers. This is diſcovered by a ſlight febricula, a little dry cough, an unuſual heat, a redneſs of the lips and mouth, a flushing in the face; which are moſt apparent when the new chyle enters into the blood; a propenſity to ſweating when aſleep, a weakneſs, a ſhortneſs of breath increaſing upon the leaſt motion,

In that age when the veſſels have attained their full growth, and will not admit of any further lengthening; when at the ſame time the blood increaſes in quantity, acrimony, and force; which happens between the ſixteenth and thirty-ſixth year of the patient's age.

In an hereditary diſpoſition to this diſeaſe.

Theſe diſpoſitions to a phthiſis are haſtened,

By a ſuppreſſion of accuſtomary evacuations, eſpecially the ſanguineous; as the hæmorrhoids, menſes, lochia, bleeding at the noſe, uſual blood-letting, chiefly in the plethoric, and thoſe who have loſt a limb.

By any violent ſhock of the lungs, by coughing, ſhouting, ſinging, running, violent efforts of the body, anger, and wounds.

By ſharp, ſaline, aromatic aliment, or drink; by the particular manner of living; by another diſeaſe, whence the quantity, acrimony, velocity, rarefaction and heat of the blood are increaſed. Hence it frequently happens from acute fevers, the plague, ſmall-pox, and ſcurvy.

II. Likewiſe this collection of pus may proceed from a peripneumony, which terminates in an apoſtem.

III. When there is an empyema formed, it may corrode, deſtroy, and conſume the lungs, and ſo produce the ſame diſeaſe as if they were waſted away by an ulcer generated in their own ſubſtance

The ſign of an approaching phthiſis is a dry cough, which may continue for ſome months; whereas a ſimple catarrh is attended with ſpitting, and is but of ſhort duration. Vomiting, or a diſpoſition to vomit after eating, excited by the above mentioned cough, is a moſt certain ſign of a phthiſis.

It invades perſons from eighteen to thirty five years of age; the whole body waſtes away. There is a hectic fever, which is moſt apparent after meals, and is known by the quickneſs of the pulſe, and the redneſs or flushing of the cheeks: The matter brought up by the cough is bloody or purulent; if it is ſpit into the fire, it yields an offenſive ſmell; if into a veſſel of water, it falls to the bottom Though it is thick, it is not glutinous or tenacious, but fluid, and of different colours, *viz.* yellow, green, but moſt commonly of an aſh-colour.

This diſeaſe begins with a ſlight pain, moderate heat, and an uneaſy or oppreſſive ſtraitneſs of the breaſt. When blood is brought up by coughing, it is generally of a florid, ſcarlet colour, and frothy, and proceeds from the lungs with a remarkable noiſe. It is mixt with fibres, films, and ſmall portions of arterial, venal, and bronchial veſſels: The pulſe is ſoft, ſmall, and undulating; the breathing is difficult; and theſe ſymptoms are preceded by a ſaltiſh taſte in the mouth.

Blood is coughed up from the lungs ſometimes without any pain; and if there is a veſſel broken, it moſt commonly flows out in a great quantity at the firſt eruption, and afterwards more ſparingly.

Spitting of blood is cured by copious bleeding every third day, to the fourth time, or till the inflammatory pellicle entirely diſappears. Sydenham adviſes the taking away 10 ounces of blood, to take the common purging potion the next morning, and at night an ounce of diacodium. Hoffman likewiſe adviſes gentle purging and pediluvia, as alſo putting the hands into warm water. For appeaſing the orgaſm of the blood, he thinks nothing better than ſpirit of vitriol, but more eſpecially the tincture of roſes acidulated therewith. Morton very judiciouſly prefers the Peruvian bark. Refrigerating, thickening, ſtyptic lenient remedies, uſed a conſiderable time, are ſeviceable, with which may now and then be mixed the moſt lenient balſamics.

Hoffman adviſes the following powder, as preferable to every thing elſe, in appeaſing the ſpaſmodic ſtrictures of the lungs.

1. Take ſeeds of white henbane, and crabs-eyes, of each a dram; 12 grains of nitre; and one grain of camphor. Make them into a powder.

A prudent uſe of the nonnaturals is likewiſe neceſſary, that may beſt oppoſe the cauſe of the diſeaſe; and chiefly a proper aliment, and manner of living; a milk-diet is preferable to any other.

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When the cure is performed, it will be neceſſary, by way of prevention, to bleed once in ſix months, for ſeveral years together.

But if, by reaſon of the violence of the diſorder, or the unſkilful uſe of ſtyptics, there ſhould, after the ſpitting of blood, ariſe a difficulty of breathing, which continually increaſes, a wandering ſhivering heat and redneſs of the cheeks, a dry huſky cough, a ſlight hectic fever, a preternatural thirſt, a weakneſs, or ſenſe of weight in the breaſt, it is a ſign that the wound from whence the blood flowed has already begun to change to matter about its lips. Then under the cruſt of dried blood *pus* is formed; and this collection degenerates into a latent VOMICA; and that being broken, becomes an open ulcer of the lungs.

The effects of an ulcer of the lungs thus formed, are generally theſe which follow: An increaſe of the acrimony and quantity of the putrid pus, a dilatation and corroding maceration of the membrane or bag in which it is contained; a converſion of the blood-veſſels and the bronchia into pus; a purulent conſumption of the whole lungs, or of one of its lobes; a continual dry cough, or ſpittle ſhook off by the conſtant concuſſions of the cough; a converſion of the blood flowing into the ulcer into pus; an increaſe of the vomica in the lungs; the burſting of this vomica into the tube of the larynx; the ſometimes ſuffocating diſcharge of the pus, or the daily coughing up of matter, which ſinks in water, and is thick, ſweet, fat, fetid, white, red, yellow, livid, aſh-coloured, or ſtreaked, and which, put into the fire, has the ſmell of burnt fleſh. Sometimes the vomica breaks into the cavity of the thorax; from whence proceeds difficulty of breathing, and the other ſymptoms of an empyema. Then the reſpiration grows exceeding bad; the chyle and the whole maſs of blood are converted into pus; the uſual method of nouriſhment is deſtroyed, the ſolids continually conſume and waſte away; a hectic fever appears, with a ſmall languid pulſe, and the heat in the upper parts intenſe, the cheeks look red, and the face hippocratic. Generally there is an inexpreſſible anxiety towards the evening; an unuſual thirſt; profuſe nocturnal ſweats; red puſtules; a ſwelling of the feet or hands on the ſide affected; exceſſive weakneſs; a hoarſe voice; a falling off of the hair; an itching throughout the body, with watery puſtules; a debilitating diarrhœa, with yellow, fetid, purulent, cadaverous ſtools; a ſuppreſſion of the ſpitting; and then death.

Hence the following prognoſtics may be formed.

An hereditary phthiſis is the moſt dangerous of all, and is incurable unleſs the ſpitting of blood be prevented.

A phthiſis from external violence, that is, proceeding from ſpitting of blood cauſed thereby, is the ſlighteſt of all.

A phthiſis in which the vomica breaks ſuddenly, and the patient eaſily brings up a white, concocted, ſmooth pus, and in quantity proportionable to the ulcer, without thirſt, and with a good appetite and digeſtion, due ſecretions and excretions, is curable, though with difficulty.

Heavy, ſolid, ſtinking, ſweet ſpittle, with night-ſweats, livid cheeks, paleneſs of the face, the noſtrils pinched up, ſinking in the temples, incurvation of the nails, falling off of the hair, and a colliquative diarrhœa, are ſigns of approaching death.

When a vomica is known to be formed in the lungs, then the phyſician muſt endeavour to ripen and break it; which is to be done by milk-diet, riding on horſeback, warm vapours and expectorants: Which done,

1. The blood muſt be guarded and defended againſt the purulent infection, by remedies which are moderately and agreeably acid and ſaltiſh, by vulnerary herbs, ſmooth balſamics given in various forms, in great plenty, and continued a long time.

2. The ulcer muſt be cleared as ſoon as poſſible from the purulent matter, the lips of it cleanſed and conſolidated, which is to be done by liquid medicines, by things which promote coughing, by motion, riding, country-air; theſe are expellents. The cleanſers are detergent balſamics, uſed inwardly and outwardly. The conſolidators are paregorics.

3. The aliment muſt be ſuch as requires the leaſt force to make it paſs freely through the lungs, and be there aſſimilated, and at the ſame time be fit for nouriſhment. Aſſes milk is very ſuitable to this intention, as alſo buttermilk.

Small repeated bleedings are not only beneficial in old coughs, threatening conſumptions, but alſo after purulent ſpitting and hectic ſymptoms have appeared. The quantity of blood to be drawn is from four to ſeven or eight ounces, once in eight or ten days.

Setons, or iſſues made in the ſide of the part that is moſt affected, are very beneficial.

We muſt endeavour to diminiſh the defluxion on the lungs, by bleeding and gentle purging, as well as pectorals, accommodated to the various ſtates of the diſtemper, *viz.* by thickening medicines and attenuants, and ſuch as temperate the hectic fever, with emulſions and aſſes milk, *&c* and laſtly, by healing the ulcer with balſamics, as opobalſamum; the doſe is 20 drops upon ſugar; but this is not to be taken before due evacuations have been firſt made.

After evacuations, great care muſt be taken that the cough be appeaſed, leſt the lungs ſhould be weakened by the continual agitation.

The moſt ſovereign remedy to reſtore the lungs to their priſtine vigour is to get on horſeback every day; and he that will put himſelf upon this exerciſe for a cure, need not be tied down to any ſtrict rules of diet, nor be debarred from any ſort of meat or drink, ſince the whole ſtreſs of the matter depends wholly on the conſtant and continual exerciſe of riding. Long ſea-voyages have of late been greatly recommended.

In the firſt ſtage of this diſeaſe, when the lungs, trachæa, and glands, throughout the whole pulmonary tube, are ſtuffed with a pituitous matter, ſeparated from the maſs of blood, and the patient is afflicted with a continual cough, eſpecially in the night-time, all proper methods muſt be uſed to ſtop the influx of this catarrh, and to concoct the humours already impacted.

Firſt, Blood muſt be taken from the arm, from ſix to ten ounces, if the patient is plethoric, or accuſtomed to bleeding; this is to be repeated once, twice, or thrice, at proper intervals, eſpecially if the flux of ſerum is like a ſuffocating

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ſuffocating catarrh, together with the copious expectoration of a crude phlegm; or where there is an aſthmatic difficulty of breathing, a pain in the ſide, or the ſigns of any diſpoſition to a rheumatiſm, a pleuriſy, or a peripneumony.

After bleeding, eſpecially if there is a nauſea, or an inclination to vomit, it will be neceſſary to give an emetic with oxymel of ſquills [or ipecacuanha wine,] which will ſometimes ſtop the progreſs of an incipient phthiſis. The emetic, if it agrees with the patient, and there is occaſion for it, may be repeated every third or fourth day. The beſt time is towards the evening; and after the operation is over, an opiate will be proper.

Nor muſt thoſe remedies that ſoften, lubricate, thicken and concoct the phlegm, be omitted; ſuch as ſugar-candy, barley ſugar, old conſerve of roſes, juice of liquorice, the white and black trocnes of the London diſpenſatory; freſh butter in water-gruel, ſweet oil or oil of ſweet almonds, eſpecially linſeed oil cold drawn, of which the patient may take a ſpoonful every hour, unleſs there is a diarrhœa, or any other contra-indicating ſymptoms. He may alſo eat raiſins and figs.

The air ſhould be pure, far from bogs and marſhy places, and the ſmoak of ſea-coal; the aliment light of digeſtion; the drink ſmall, for ſpiritous liquors ſhould be avoided. The patient ſhould uſe exerciſe, and keep his mind as free from paſſions as poſſible.

The ſecond ſtage of this diſeaſe may be reckoned from the firſt formation of the tubercles, till they begin to inflame and putrify, that is, while they remain in a crude ſtate. This is known from the increaſe of the hectic fever; from the waſting and flaccid ſtate of the muſculous fleſh, from the dryneſs of the cough, for the ſpitting conſiderably abates; and from the great weight and oppreſſion which is continually felt in the breaſt.

In this ſtage, all evacuations by vomit, ſtool, and ſweat, are pernicious; for they increaſe the fever, and accelerate the conſumption. Nor is bleeding otherwiſe proper, than as it prevents an inflammation, and then it muſt be uſed with a ſparing hand, when there are pleuretic pains, or the patient hath catched a freſh cold.

Beſides alterative medicines, taken in ſmall quantities, and at ſtated times, endeavours muſt be uſed to cool the febrile heat of the blood, and decreaſe the quantity of the noxious humours. The diet muſt be ſuch as will obtund the acrimony of the humours; as patridges, mountain-birds, poached eggs, oiſters, calves-feet and jellies, and ſoups made therefrom; alſo craw fiſh and other ſhell-fiſh, and broths made of their fleſh. Likewiſe ſpaw-waters, pectorals, hydromel, a milk diet, aſſes milk, milk-water, millepedes, ſnails, and the like; together with iſſues, ſhaving the head, and proper plaiſters.

In the third ſtage of this diſeaſe little hopes remain of a cure, unleſs the ulcers are ſmall and benign.

In this ſtate of the diſeaſe, opiates ſhould be ſparingly uſed, even though the cough and want of reſt require them, becauſe they not ſeldom bring on ſudden death. Jellies and broths are likewiſe to be directed; for, in ſhort, there is now more help to be expected from the kitchen than from the apothecary's ſhop.

The diet ſhould be water-gruel, ptiſans of ſcalded apples, poſſet-drink, ſtoned raiſins and liquorice, table-beer warmed with a toaſt, and the like. When the fever is on the decline, chicken broth, poached eggs, *&c.*

If there is occaſion, the body muſt be looſened with clyſters of ſugared milk, with chamomile flowers, and repeated as occaſion requires; then take away ten ounces of blood on the ſide affected, which ſhould be boldly repeated every, or every other day, according to the urgency of the ſymptoms.

In colliquative ſweats, pearl juleps may be freely given, to which may be added chalk, corals, dragon's blood, or other abſorbents. But the Peruvian bark for this pupoſe, is much better than any other medicine whatever. The patient ſhould not be permitted to ſleep too long, the bed-cloaths ſhould be light, and he ſhould be removed to fine ſubtle air.

Of the Nervous Consumption.

A nervous atrophy or phthiſis, is a waſting of the body, without any remarkable fever, cough, or difficulty of breathing; but is attended with want of appetite and a bad digeſtion; whence the whole body grows languid, and is continually falling away.

At firſt the body is œdematous, and as it were ſtuffed with a vapid chyle; the face looks pale and bloated, and the ſtomach lothes every thing but liquids. The patient is forced to keep his bed ſooner than the progreſs of the decay of his fleſh ſeems to require. The colour of the urine is uncertain, but it is generally very red and ſmall in quantity; ſometimes it is pale and copious.

No conſiderable fever is diſcernible either by the pulſe, heat, or thirſt, though the urine is ever ſo red.

The cauſes of this diſeaſe are generally violent paſſions of the mind, a too free uſe of ſpiritous liquors, and unwholſome air.

Stomachic and nervous remedies are only to be depended upon; ſuch as, chalybeates, antiſcorbutics, cephalics, and bitters. If the body be coſtive, two ounces of tinctura ſacra may be taken every fourth evening, and from 30 to 40 drops of elixir aloes, in a glaſs of white-wine with bitters, before dinner. The elixir of vitriol is excellent in this caſe, 20, 30, or 40 drops is a doſe, in any convenient vehicle, once, twice, or thrice a day. Alſo about half an ounce of the chalybeate wine, in ſome proper liquid, in the winter; in the ſummer, the ſpaw waters: the uſual drink may likewiſe be made bitter with the *vinum amarum*; but nothing ſtrengthens the ſtomach more than a decoction of wormwood.

Sometimes the patient may take eight or nine drops of opobalſamum, or ſpirit of hartſhorn, or of ſal ammoniac, as friendly to the nerves; nor muſt he forget exerciſe and chearful company, with other diverſions.

Of an Empyema.

An Empyema is a collection of purulent matter in the cavity of the thorax, between the lungs and the pleura, which always ſuppoſes the breaking of a vomica into the ſaid cavity.

Such are the vomicæ or abſceſſes of the lungs, proceeding from inflammations, from ſpitting of blood, from

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a thick matter which cannot be expectorated. Of the pleura, from an inflammation, from a wound therein, healed outwardly but open inwardly; from a bruiſe, or a concealed rupture of it, turning to pus. Of the diaphragm, when, after an inflammation, it ſuppurates, and breaks on its upper part. Alſo of the mediaſtinum and pericardium affected in the like manner.

An empyema may be foreſeen from an inflammation of any of the above mentioned parts, which is not terminated and reſolved by concoction, revulſion, a criſis, or medicines; but is followed by ſhiverings, a febricula increaſing at night, a wandering heat, a ſenſe of heavineſs in the part that was pained, a difficulty of breathing, a want of appetite, and an unuſual thirſt.

An actual empyema is known from twenty days being elapſed ſince the inflammation began, without expectoration of the matter; from the ſigns of a vomica in the five abovementioned parts diſappearing; from a new pain, cough, difficulty of breathing, and ſpitting, ariſing, and afterwards going off; from a dry cough, a weight on the diaphragm, not being able to lie but on one ſide, a noiſe made by the fluctuation of the pus, upon moving the body; from a ſlow fever, a flushing in the cheeks, hollow eyes, heat in the ends of the fingers, crookedneſs of the nails, and a ſwelling of the abdomen.

The conſequences of this diſeaſe are, a continual accumulation of pus from the ulcer not yet healed; the matter increaſing in its acrimony, putrefaction, rank ſmell, and thinneſs, by being ſhut up in a hot, moiſt place; an impediment in raiſing the diaphragm and extending the lungs; a ſhortneſs and difficulty of breathing, and not eaſily performed unleſs in an erect poſture, a dread of ſuffocation when laid down; an inability of lying, but on the affected ſide; a conſtant dry cough, with anxiety; a maceration and corroſion of the lungs, pleura, diaphragm, pericardium, and even of the heart itſelf, converting them gradually into filthy corruption; whence a hectic fever, quick, ſmall pulſe, conſtant redneſs of the cheeks, loſs of appetite, perpetual thirſt, extreme weakneſs, and fainting fits. Hence all the fluids become unfit for nutrition, circulation, or any other office: The conſequence of which is, a waſting of the whole body; a putrefaction of the fluids, which may be diſcharged through the corroded lungs, or carried downwards by a fatal ſanious diarrhœa; night-ſweats, puſtules in the face, crooked nails, a ſhining yellowneſs of the ſkin, and a hippocratic countenance.

The cure of this diſeaſe is different, according to its different cauſe and ſtate.

When a vomica or abſceſs is known to be formed in any of the parts before mentioned, all endeavours are to be uſed, that it may be ſpeedily broken and determined to the outward parts, which muſt be attempted by actual or potential cauteries, or by inciſion and proper motion.

When the vomica is actually broke, then it is to be evacuated by the mouth, if nature ſeems to encourage it; or by urine, if there appear any ſigns in it of paſſing that way; or by an aperture of the thorax by a proper inſtrument. See SURGERY.

In general, all inflammations of the lungs or pleura are followed by an adheſion of theſe parts, which allow nature to make a paſſage externally: And it is common in abſceſſes of the pleura and intercoſtal muſcles to find them break outwardly; nor is it uncommon even in the lungs. Therefore, when there is an adheſion, no other operation is neceſſary than to open the tumour with a lancet, when the pus is formed; and if the ſuppuration is ſo plentiful as not to admit the healing of the outward ulcer, it may be kept open with a hollow tent.

Hoffman gives an inſtance of a perſon, who, after a peripneumony, fell into an empyema, and was cured by taking milk boiled with ſugar of roſes. The quantity was three pints a-day. As alſo balſamic pills made of flowers of ſulphur, oil of ſweet almonds, ſperma ceti, venice turpentine, ſaffron, and oil of aniſeed. Likewiſe a powder made of crabs eyes, ſperma ceti, ſugar, myrrh, liquorice-powder, and bole armoniac.

Of the SCURVY.

THIS diſtemper chiefly affects the inhabitants of cold northern countries, and eſpecially thoſe who live in marſhy, low, fat and moiſt ſoils, near ſtagnating water, whether freſh or ſalt. Thoſe who live idle ſedentary lives are moſt ſubject, chiefly in the winter, to the attacks of this diſeaſe; as alſo thoſe who feed upon ſalted and ſmoak-dried fleſh or fiſh, ſea-biſcuit, ſtinking water, unfermented farinaceous vegetables, peaſe, beans, ſharp ſalt old cheeſe: likewiſe thoſe who are ſubject to melancholic, maniacal, hyſteric, or hypochondriacal diſorders.

It is known by ſpontaneous wearineſs, heavineſs of the body, difficulty of breathing, eſpecially after bodily motion; rottenneſs of the gums, a ſtinking breath, frequent bleeding of the noſe, difficulty of walking: ſometimes a ſwelling, ſometimes a falling away of the legs, in which there are always livid, plumbeous, yellow, or violet-coloured ſpots; the colour of the face is generally of a pale tawney.

The firſt ſtate of this diſeaſe begins with unuſual lazineſs, ſpontaneous wearineſs; the patient loves to be in a ſitting or lying poſture; there is a pain in all the muſcles, as if he was over tired, eſpecially of the legs and loins; when he wakes in the morning, all his joints and muſcles ſeem to be tired and bruiſed.

In the ſecond ſtate, the gums ſwell, grow painful, hot and itching, and bleed upon the leaſt preſſure; the roots of the teeth become bare and looſe; he feels pains in all the external and internal parts of the body, imitating diſtempers proper to the various parts.

In the third ſtate, the gums at length grow putrid, with a cadaverous ſmell; when they are inflamed, blood diſtils from them, and a gangrene enſues; the looſe teeth by degrees grow yellow, black, and rotten; the ſublingual veins become varicous, and like rings; there are often fatal hæmorrhages, which break out from the external ſkin, without any appearance of a wound from the lips, gums, mouth, noſe, lungs, ſtomach, liver, ſpleen, pancreas, inteſtines, womb, kidneys, *&c.* Obſtinate ulcers ariſe, of the very worſt kind, which no applications will cure, and which are apt to turn to a gangrene; they break out in all parts, but eſpecially the legs, and are attended with a ſtench. There is a kind of an itch and dry ſcabs, with

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with a dry and mild leproſy. The blood drawn from a vein is black, grumous, thick, and yet wants its due conſiſtence in the fibrous part; the ſerum is ſalt, ſharp, and abounding with a yellowiſh green mucus on its ſurface. There are gnawing, rending pains, quickly ſhifting from place to place, which grow more violent in the night, affecting all the joints, bones, and viſcera.

In the fourth ſtate, there are fevers of various kinds, which bring on an atrophy; ſometimes diarrhœas, dyſenteries, or violent ſtranguries; as alſo faintings and mortal anxieties, a dropſy, conſumption, convulſions, trembling, a palſy, contractions, black ſpots, voiding of blood upwards and downwards, a putrefaction and conſumption of the liver, ſpleen, pancreas, meſentery. Now the contagion ſpreads very quick.

The firſt ſign of the approach of this diſeaſe is commonly a change of colour in the face, which becomes pale or yellowiſh, and bloated, with a liſtleſſneſs, and an averſion to exerciſe. The caruncles of the eyes appear of a greeniſh caſt, and yet in other reſpects the patient ſeems in perfect health. However, the change of colour in the face does not always precede the other ſymptoms, though it conſtantly attends them. Then an univerſal laſſitude ſupervenes, and a ſtiffneſs and feebleneſs of the knees, with a difficulty of breathing on the leaſt motion. Soon after this there is an itching of the gums, which ſwell, and are apt to bleed on the leaſt friction. Then they become livid, ſoft and ſpongy, and afterwards extremely putrid and fungous. This rottenneſs of the gums is an inſeparable ſign of this diſeaſe. Theſe are not only ſubject to bleed, but there are hæmorrhages from different parts of the body.

The ſkin is dry throughout the whole courſe of this diſeaſe, except towards the laſt, and in many it is rough. In ſome it appears like the ſkin of a gooſe; but it is moſt frequently ſmooth and ſhining. It is ſtained with blue, purple, livid, or black ſpots; ſome of which are ſmall, and others of a hand's breadth, when the diſeaſe is advanced. They are chiefly on the legs and thighs, but ſometimes on the arms and trunk of the body Some have a ſwelling of the ankles in the evening, which diſappears in the morning. In a little time it advances gradually up the leg, and the whole member becomes œdematous. Hurts, bruiſes, wounds healed up, and fractured parts, always become ſcorbutic firſt. Old ulcers will emit a thin fetid ſanies, mixed with blood, and at length coagulated gore will lie on the ſurface of the ſore like a cake. As the diſeaſe increaſes, they ſhoot out a ſoft, bloody fungus reſembling bullock's liver, which ſometimes will riſe to a monſtrous ſize in a night's time. The ſlighteſt bruiſes and wounds of ſcorbutic perſons degenerate into ſuch ulcers, and are eaſily diſtinguiſhed from all others, by being putrid, bloody, and fungous.

To prevent the ſcurvy at land, it will be proper to chuſe a warm, dry, pure air, with a diet of eaſy digeſtion, conſiſting chiefly of a due mixture of animal and vegetable ſubſtances; for thoſe are moſt liable to it who live in marſhy, wet ſoils, and in places ſubject to great rains and fogs; or in damp, low apartments, unleſs they keep conſtant fires, and their chief food be fleſh broths, with plenty of freſh greens or vegetables, and well-baked bread made of wheat-flour; as alſo a chearful glaſs of ſome good wholeſome fermented liquor. Cleanlineſs, entertaining amuſements, and moderate exerciſe, will alſo be good preſervatives in theſe caſes. In garriſons, the ſoldiers ſhould be kept as dry, clean, and warm as poſſible, and their proviſions ſhould be as wholeſome as can be procured, with plenty of good vegetables, particularly ſallads of garden-creſſes.

The beſt method of preventing the ſcurvy at ſea will appear from the effects which Dr Lind has obſerved ſeveral medicines have had, eſpecially thoſe which have been greatly recommended as preſervatives. On the 20th of *May* 1747, being on board the Saliſbury at ſea, he took twelve ſcorbutic patients under his care. They had putrid gums, ſpots, and laſſitude, with weakneſs of their knees. They had a proper apartment in the forehold: their diet was water-gruel ſweetened in a morning; ſometimes mutton broth for dinner, ſometimes light puddings, boiled biſcuit with ſugar, *&c.* and for ſupper, barley and raiſins, rice and currants, ſago and wine, and the like. Two of theſe were ordered each a quart of cyder in a-day; two others twenty-five drops of elixir of vitriol, three times a-day, upon an empty ſtomach, uſing a gargle acidulated with the ſame. Two others took two ſpoonfuls of vinegar three times a-day, having their gruels, other food, and gargles well acidulated with it. Two of the worſt patients, with the tendons of the ham rigid, were put under a courſe of ſea-water, and drank about a pint every day, more or leſs, according to its operation, which was intended to be as gentle phyſic. Two others had each two oranges and one lemon given them every day, which they eat with greedineſs upon an empty ſtomach, at different times. This courſe was continued but ſix days, becauſe no more fruit could be allowed. The two remaining patients took the bigneſs of a nutmeg, three times a-day, of an electuary made of garlic, muſtard ſeed, balſam of Peru, and gum-myrrh; uſing for common drink barley-water well acidulated with tamarinds; by a decoction of which, and cream, they were gently purged three or four times during the courſe.

The oranges and lemons had the beſt effect; for one of thoſe who had taken them, was at the end of ſix days fit for duty; and he took nothing more but a gargle of the elixir of vitriol for his gums, which were not quite ſound, and ſo recovered his health entirely. The other being more recovered than any of the other patients, was appointed to look after them. Next to the oranges the cyder had the beſt effects, though it was not very good, being prick'd; for thoſe who drank it were in a fairer way of recovery at the end of the fortnight, the time allowed for making the experiments, than any of the reſt. Elixir of vitriol did no good unleſs as a gargle, nor yet any of the reſt of the medicines. Oranges are preferable to lemons; for by theſe the lord Anſon's people were ſo ſpeedily and ſurpriſingly recovered at the iſland of Tinian. Beſides, Mr Murray affirms, from experience, that oranges and lemons, when properly and ſufficiently uſed, are an infallible cure in every ſtage and ſpecies of this diſeaſe, if there is any degree of natural ſtrength left, and where a diarrhœa, lientery, or dyſentery, are not joined to the

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the other ſymptoms. He obſerves farther, that at the iſland of St Thomas, fifty men belonging to the Canterbury, and ſeven to the Norwich, who were in all the different ſtages of this diſtemper, were cured in little more than twelve days.

But as oranges and lemons are apt to ſpoil, let the juice of theſe fruits be well cleared from the pulp, and depurated by ſtanding ſome time; after which it may be poured off from the groſs ſediment. Let it then be poured into any clean open veſſel of china or ſtone ware, which ſhould be wider at the top than at the bottom, that it may evaporate more readily. But a china baſon or punch-bowl is moſt proper, on account of the form. Put this into a pan of water over a clear fire; let the water come almoſt to boil, and continue nearly in that ſtate, with the bowl full of juice in the middle of it, till the juice is found of the conſiſtence of a thick ſyrup when cold. The flower the evaporation of the juice is, the better; that is, it ought to continue twelve or fourteen hours over the fire: When it is cold, it is to be corked up in a bottle for uſe. Two dozen of good oranges weighing five pounds four ounces, will yield one pound nine ounces and a half of depurated juice; and when evaporated, there will remain five ounces of extract, which in bulk will be equal to leſs than three ounces of water. So that twelve dozen of oranges may be put in a quart bottle, and preſerved ſeveral years. The ſame may be ſaid of lemons. When this is mixed with water and made into punch, few are able to diſtinguiſh it from the freſh juice mixed up in the ſame manner. However, when the freſh fruit can be had, the fragrancy of the peel may contribute ſomewhat to the cure of the ſcurvy; and when theſe are wanting, the ſame thing may be obtained from a few drops of their eſſence, or the aromatic oil contained in their rinds; and if a ſmall quantity of this be added to the extract, it will give it the ſmell and fragrancy of the freſh fruit in great perfection. Or rather add a little of the outer peel to the extract a little before it is taken off the fire, and then the niceſt taſte will not be able to diſtinguiſh the difference between the freſh fruit and this. The virtues of this extract, thus made, lie in ſo ſmall a compaſs, that a bottle will ſerve one man at ſea ſeveral years; for in the making of it there is little or nothing flies off beſides the water.

It will likewiſe be of great uſe to ſeamen to have gooſeberries, and the like, preſerved in bottles in the ſame manner as the paſtry-cooks; as alſo ſmall onions pickled in vinegar, cabbage, french-beans, *&c.* may be preſerved, by putting them in clean dry ſtone-jars, with a layer of ſalt at the bottom, then a thin layer of the vegetable covered with ſalt, and ſo alternately till the jar is full. Then the whole muſt be preſſed down with a weight, and its mouth quite ſtopped that no air or moiſture may enter. Thus the vegetable may be kept freſh and green for a whole year. At the time of uſing, the ſalt is to be waſhed off with warm water. This is the manner by which they preſerve that never-failing remedy, Greenland ſcurvy-graſs. Every common ſailor ought to lay in a ſtock of onions, for they are a great preſervative at ſea. The Dutch ſailors are preſerved from the ſcurvy by pickled cabbage. Portable ſoup may be carried to all places. When the ſcurvy begins to make its appearance, ſailors ſhould be abridged in the ſame degree of their allowance of beef and pork, and eat them with muſtard and vinegar; but the peaſe ought always to be ſerved out in full allowance. It muſt be obſerved likewiſe, that a ſoup of boiled cabbage and onions will cure an adventitious ſcurvy in its firſt ſtage, either at land or ſea, in any part of the world.

Beſides freſh and preſerved fruits and vegetables, fermented liquors of all ſorts are good, but more particularly cyder. Among theſe are included many wines of every kind; or the juices of fruits may be fermented with ale. Poor people that winter in Greenland under vaſt diſadvantages in point of air and diet, preſerve themſelves from the ſcurvy by ſpruce-beer, which is their common drink. Likewiſe the ſimple decoction of fir-tops has done wonders. The ſhrub black ſpruce of America makes this moſt wholeſome drink juſt mentioned, and affords a balſam ſuperior to moſt turpentines. It is of the fir kind. A ſimple decoction of the tops, cones, leaves, or even of the green bark or wood of theſe, is an excellent antiſcorbutic; but perhaps it is much more ſo when fermented, as in making ſpruce-beer. This is done by moloſſes, which by its diaphoretic quality makes it a more ſuitable medicine. By carrying a few bags of ſpruce to ſea, this wholeſome drink may be made at any time. But when ſpruce cannot be had, the common fir-tops uſed for fuel in the ſhip ſhould be firſt boiled in water, and then the decoction ſhould be fermented with moloſſes; to which may be added a ſmall quantity of wormwood and root of horſe radiſh. The freſher it is drank, the better. When other things are wanting, tar-water may be fermented in the ſame manner.

Thoſe who have been weakened by long fits of illneſs ſhould have the ſcurvy prevented by panada of bread newly baked, with a few drops of the extract of lemons, and a ſpoonful of wine; as alſo oatmeal and rice, gruels, flummery, ſtewed barley, with raiſins or currants, ſago, and wine, *&c.* But more particularly pickled cabbage, and ſmall onions boiled with the portable ſoup made weak. Moſt of their food ought to be acidulated with orange or lemon juice; and then as their ſtrength increaſes, they ſhould be indulged with more ſolid food. But before this, they ſhould have a ſmall quantity at a time and often, and they ſhould be brought back to their labour by little and little. Exerciſe on a deal-board, with the ends laid on two cheſts, will be very proper; becauſe it promotes the circulation, and ſtrengthens the fibres, without any loſs of ſpirits.

Bad air of any kind has a bad effect upon a ſhip's crew; to remedy which, a red-hot loggerhead ſhould be put into a bucket of tar, and moved about, ſo that all the ſhip once or twice a-day ſhould be filled with this wholeſome antiſeptic vapour. In a moiſt air, whatever promotes perſpiration is proper; ſuch as dry linen, cleanlineſs, uſing the fleſh-bruſh, garlic or raw onions before going into the rain, and keeping the bedding dry. Plenty of muſtard and onions ſhould be uſed with their victuals.

The cure of this diſeaſe has been in a great meaſure anticipated by the means of prevention, inſomuch that little remains to be ſaid about it. The diet ſhould be light

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light and eaſy of digeſtion, ſuch as broths or ſoups made of freſh meat, with plenty of vegetables, ſuch as cabbage, coleworts, leeks, onions, &c. The bread ſhould be freſh and well baked; and ſallads of all kinds are beneficial, but more particularly dandelion, ſorrel, endive, lettuce, fumitory, and purſlane; to which may be added, ſcurvy-graſs, creſſes, or the like, to correct the cooling qualities of the former. Summer fruits are all good, as oranges, lemons, citrons, apples, &c. The drink may be good ſound beer, cyder, or Rheniſh wine. Phyſic is never neceſſary if the freſh broths and greens keep the belly open, and paſs freely by urine, ſweat, and perſpiration. If otherwiſe, the patient may take a decoction of tamarinds and prunes with a diuretic ſalt; and on intermediate days he may be ſweated with camphorate boluſes of theriac, and warm draughts of a decoction of the woods, of twelve or fifteen grains of the ſquill pills of the Edinburgh diſpenſatory.

Milk of all ſorts, if it agrees with the conſtitution, will be very beneficial, as well as whey, which is preferable. Sal polychreſt is uſe as a mild purgative and excellent diuretic. The ſcorbutic juices, qualified with the juice of Seville oranges, are proper, eſpecially mixed with the clarified whey, with ſweating twice or thrice a-week with the ſaid juice mixed with ſack-whey; for this is an evacuation which ſcorbutic perſons bear the beſt. When there is no danger of an hæmorrhage, warm baths, with roſemary, marjoram, thyme, &c. may be good. In the winter-time, genuine ſpruce-beer, with lemons and orange juice, is proper; or antiſcorbutic ale, made of an infuſion of wormwood, horſe-radiſh, muſtard-ſeed, and the like; and it may be made laxative with the addition of ſenna. It muſt be drank while pretty freſh or new. Van Swieten ſays, he has often ſeen whole families cured of the ſcurvy, in Holland, by the uſe of a caſk of ale, in which were put heads of a red cabbage cut ſmall, twelve handfuls of creſſes or ſcurvy-graſs, and a pound of freſh horſe-radiſh previouſly infuſed.

When the gums begin to itch and are ſpungy, uſe a gargle of the bark infuſed in brandy. When the putrefaction increaſes, uſe barley-water and honey of roſes, acidulated with a mineral acid. The fungus muſt be kept down, and when neceſſary, cut away. The ulcers of the gums muſt be checked with a touch of ſpirit of ſalt, or oil of vitriol diluted. When the legs are ſwelled, or œdematous, gentle frictions are to be uſed at firſt with warm flannel, or with woollen cloths charged with the fumes of benjamin and amber, provided the ſwelling be ſmall, ſoft, and not very painful, rolling them up afterwards with an eaſy bandage from below upwards: But if they are much ſwelled, ſtiff, and painful, they muſt be fomented with a diſcutient fomention, or rather the ſteam of the fomentation ſhould be received through a blanket rolled round the limb. This operation, repeated night and morning, will render the contracted joints ſupple. After this has been continued for half an hour, the parts are to be anointed with palm oil. If a vegetable diet does not reduce the limb, ſweat it with burning ſpirits, or bags of warm ſalt.

Ulcers of the legs muſt be treated with very gentle compreſſion, to keep the fungus under; and the ſame applications muſt be uſed as to the rotten gums. Mr. Murray has found a ſtrong tincture of the bark of great ſervice in ſcorbutic ulcers. In dangerous hæmorrhages the mineral acids muſt be given by a little at a time and often; ſuch as the ſpirit or elixir of vitriol, together with ſmall doſes of the Peruvian bark.

A ſcorbutic diarrhœa ſhould not be ſuddenly ſtopt at ſea, but the peccant humour muſt be gently evacuated with ſmall doſes of rhubarb, and the perſpiration kept up with a little theriac or diaſcordium, with other warm diaphoretic and ſtrengthening medicines. In extreme caſes, opium may be given more freely. The diet muſt be glutinous and ſubaſtringent, with ſtrong rough red wine diluted. Sometimes five grains of alum may be given with the diaſcordium, eſpecially when blood is evacuated in great quantities. The moſt effectual remedy in ſcorbutic dyſenteries is an infuſion of ipecacuanha in brandy, given in ſmall doſes, and often repeated.

Phyſicians refer the different ſymptoms of this diſeaſe to different ſalts; but their different and far-fetched corrections of theſe ſalts are plainly ridiculous. Water is the known ſolvent of all ſalts, and this intention will be beſt anſwered by pure and light ſimple water. The univerſal remedy for a ſcurvy conſiſts in mineral waters.

After mineral waters, nothing is more effectual in correcting a ſcorbutic acrimony than a milk diet, or whey alone, or impregnated with the juices of antiſcorbutic herbs, ſuch as ſcurvy-graſs and water creſſes.

As to evacuations, bleeding ſhould be uſed with the greateſt caution; and none but the gentleſt purges ſhould be given, ſuch as ſenna, rhubarb, or manna. The diuretics ſhould not be ſtronger than the decoction of the roots of parſley, celery, fennel, and aſparagus. The ſafeſt diaphoretics are, dulcified ſpirit of nitre, flowers of ſulphur, ethiops mineral; infuſions, in the manner of tea, of Paul's betony, carduus benedictus, ſcordium, and elder-flowers.

In the hot or alkaline ſcurvy, ſcurvy-graſs is too warm to be adminiſtred alone, and ſhould be corrected with acids, ſuch as wood-ſorrel, the juices of citrons, oranges, barberries and pomegranates. Or mix the conſerve of ſcurvy-graſs with an equal quantity of the conſerve of wood-ſorrel, and give it twice or thrice a day, with ſome antiſcorbutic water. This ſhould be accompanied with milk-meats, almond-emulſions, barley-broths, water-gruel, chicken-broths, with endive, lettuce, ſorrel, and creſſes, interpoſing, at proper intervals, gentle laxatives and diuretics.

When the ſcurvy proceeds from muriatic ſalts, which happens to thoſe who live on ſmoaked or high ſalted fiſh or fleſh, and have corroding ulcers, a ſtinking breath, putrid gums, a thick and ſaltiſh urine, as is generally obſerved in old ſailors; then whey, long and copiouſly drank, produces happy effects; as alſo citrons, China oranges, and ripe fruits; whereas ſpirituous and volatile antiſcorbutics are generally detrimental. HOFF.

But if cruſty black ulcers require external remedies, we ſhould only uſe preparations of the yolk of an egg, myrrh, olibanum, ſaffron, oil of roſes, and Peruvian balſam. When there is an exceſſive impurity of the humours tending to putrefaction, ſcarifications will induce

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a gangrene, which may be prevented by lime water, exalted with camphorated ſpirit of wine and ſal ammoniac.

But fomentations and cataplaſms of the common hemlock, frequently repeated and duly continued, are found more effectual than all other remedies.

Of the Dropsy.

Dropsies are of various kinds; but thoſe uſually treated of by authors are the anaſarca, aſcites, and tympanites.

When the lymph ſtagnates throughout the whole habit of the ſubcutaneous fat, or is ſhed therein, it produces an anaſarca, which extends itſelf alſo to the abdomen and ſcrotum.

When the water is collected in the duplicature of the peritonæum, in the cavity of the abdomen, between the peritonæum and the viſcera of the abdomen, or in the dilated cavities of the glands and veſſels contained in the abdomen, it is called an aſcites. If the dropſy is owing to the rarefaction of ſome ſteam or vapour, ariſing from water, pus, ichor, or air, pent up and heated till they putrefy, then it is a tympany.

The cauſe of theſe diſeaſes may be, a family diſpoſition thereto; a haſty drinking too great a quantity of cold water, and its not being evacuated upwards or downwards, or by ſweat, or urine excited by heat or motion; acute diſeaſes, eſpecially the moſt ardent, attended with unquenchable thirſt, or otherwiſe; a lienterious dyſentery of a long continuance; all obſtinate obſtructions of the viſcera; and a ſchirrus of the liver, ſpleen, pancreas, meſentery, kidneys, womb, or inteſtines; the jaundice; a violent quartan ague of long duration; a lientery; a diarrhœa; a long dyſentery; the cœliac paſſion, an empyema; a conſumption; the gout; too great evacuations, chiefly the blood; the drinking of ſharp, fermented, and ſpirituous liquors; the feeding on tenacious and hard aliment; very large and numerous hydatides hanging in the cavity of the abdomen; melancholy; the ſcurvy, and the like.

The firſt ſign of the approach of this diſeaſe is the ſwelling of the feet and ancles, which in the evening will pit, if preſſed with the fingers; which ſwelling diſappears in the morning, eſpecially if there begins to be a difficulty of breathing. And yet it muſt be remembered, that pregnant women, or whoſe menſes are ſtopped, as alſo when ſuddenly freed from an inveterate aſthma, are affected with the like ſwelling. When the feet and legs are diſtended to the utmoſt, the waters ruſh into the abdomen, and cauſe it to ſwell by little and little, till at length the more noble viſcera are affected therewith, and the patient is ſoon overwhelmed with the deluge. In proportion as the diſeaſed parts increaſe in bulk, the reſt fall away: at the ſame time the difficulty of breathing, paucity of urine, and intenſe thirſt, the three principal ſymptoms, grow more intolerable.

When the abdomen is ſwelled, it will ſound when ſtruck, if the diſeaſe is a tympany. In the aſcites there is a noiſe of the fluctuating water upon bodily motion, unleſs the waters are incloſed in a cyſtis or bag.

Beſides the above-mentioned ſymptoms, there is a heavineſs, a torpor, a coſtive body, and at length a ſlow fever; the patient never ſweats. In proceſs of time, the ſtagnating waters, being pent up in a hot place, become acrimonious; hence ulcers, gangrenes, bleeding at the noſe, a protuberance of the navel, a mortification of the viſcera, and death.

The curative indications in an anaſarca, as well as in an aſcites, are to reſtore the humours to their natural fluidity; to invigorate the languid circulation; to brace up and ſtrengthen the relaxed ſolids; to promote the ſecretions; and to carry off the redundant ſtagnating juices.

Strong draſtic purges, ſteel medicines, abſorbents, detergents and ſtomachics, are beſt ſuited to anſwer theſe intentions.

The firſt thing to be done is to evacuate the ſerous humours by cathartics.

There are two things of uncommon efficacy in the dropſy; theſe are, elaterium and antimonial wine, eſpecially for thoſe which are not eaſily purged; two grains of the former is a proper doſe for moſt conſtitutions.

As for the antimonial wine, an ounce and a half, or two ounces, as the patient's ſtrength will admit, given in the morning, will in due time free the abdomen from the load of water. If it does not purge downwards as well as upwards, mix it with ſyrup of buckthorn after the third or fourth doſe.

Some greatly recommend Bontius's pills for the dropſy, the doſe of which is from half a ſcruple to a ſcruple; but Heiſter preſcribes them from half a dram to a dram.

Mayrne affirms, that mercurius dulcis, without doing any miſchief to the body, acts directly upon the morbific cauſe, and if poſſible deſtroys it. If a ſalivation follows, it is not dangerous, but may be prevented if the mercurial be joined to an active cathartic.

Many praiſe the juice of the root of iris paluſtris lutea; and we have an inſtance of its efficacy in a moſt deplorable dropſy, in the *Med. eſſays*; eighty drops of which were given every hour in a little ſyrup of buckthorn, which brought away many quarts of water by ſtool the firſt night; the quantity was daily increaſed till it came to two drams, and at laſt was mixt with a fourth part of the ſyrup, and given by ſpoonfuls.

Sometimes purgatives are to be entirely omitted, when the patient is of a weak conſtitution, or women ſubject to vapours; and then diuretics only ſhould be made uſe of; among which, thoſe are moſt powerful which conſiſt of lixivial ſalts

Boerhaave likewiſe propoſes to attenuate the humours by ſmall doſes of mercurial preparations, to be taken every other morning, in a little pulp of a roaſted apple; as half a grain of turbith mineral, with ten grains of white ginger; or one grain of red precipitate, with ſix grains of nutmeg; or ſeven grains of calomel, with eight of winter's bark.

Some have been cured by a pertinacious abſtinence from all liquids, living upon ſea biſcuit with a little ſalt, and a very little rich wine. Externally, frictions of the parts have been found beneficial.

Of

Of the HYDROCELE, *or* DROPSY *of the* SCROTUM.

THE hydrocele, called the dropſy of the ſcrotum, *hernia aquoſa*, and the dropſy of the teſticle, is an aqueous tumour of the ſcrotum. Though authors mention ſeveral kinds, there are but two. The firſt is, when the water is contained in the tunica vaginalis; the ſecond, when it is contained in the cellular membrane of the ſcrotum. This laſt is almoſt always complicated with an anaſarca, a kind of dropſy which conſiſts in the extravaſation of the water which lodges in the cells of the membrana adipoſa. The hydrocele in this caſe is known without any difficulty; for the ſkin is ſhining and ſoft, yielding eaſily to a ſlight impreſſion, which will remain pitted for ſome time; the penis is alſo ſometimes prodigiouſly ſwelled by the liquor which inſinuates into the cellular membrane. There are none of theſe ſymptoms in the dropſy of the tunica vaginalis.

In the dropſy of the cellular membrane of the ſcrotum, ſome recommend the puncture with a trochart; others, to make ſmall apertures here and there with the point of a lancet; others, to put a ſmall ſkane of ſilk through the ſkin with a needle, and to let it remain as a ſeton, till all the water is drained off. But the two firſt methods yield very little relief, and the laſt may be more likely to induce a gangrene. Nor is there occaſion for any operation at all, becauſe the cellular membrane of the ſcrotum is nothing but a continuation of the membrana adipoſa; and therefore ſcarifications made in the ſkin of the ſmall of the legs will effectually empty the ſcrotum.

Yet ſometimes there falls ſo great a quantity of water into the ſcrotum, that the diſtenſion is very painful, threatening a mortification. Likewiſe the prepuce very often is ſo exceſſively dilated and twiſted, that it hinders the patient from making water.

In theſe caſes there ſhould be an inciſion made on each ſide the ſcrotum, three inches in length, quite through the ſkin, into the cells which contain the water; and likewiſe two or three, half an inch long, in any part of the penis, with a lancet or knife.

The dropſy of the tunica vaginalis is cauſed by an exceſſive accumulation of a ſeroſity, which is naturally ſeparated in the internal ſurface of that tunic in a ſmall quantity, to moiſten and lubricate the teſticle. Authors have hitherto diſtinguiſhed them into two ſorts; the one on the inſide of the tunica vaginalis: and the other on the outſide, between that and the ſcrotum, which they ſuppoſe to proceed from water in the dropſy aſcites. But anatomy ſhews the abſurdity of this opinion; for beſides that perſons afflicted with this kind of hydrocele have ſeldom any other dropſy, and thoſe who have the aſcites are free from this hydrocele, the tunica vaginalis is like a purſe quite ſhut up on the outſide of the abdomen, ſo that the water cannot inſinuate into it from any part.

As to the notion that the water falls from the abdomen into the interſtice between the tunica vaginalis and the ſcrotum, it is equally impoſſible. For though in the inteſtinal rupture the gut falls into this place, yet it brings the peritonæum along with it, and that will prevent the egreſs of the water. This is a circumſtance the ancients were unacquainted with, and the moderns have not ſufficiently attended to.

This diſorder is ſeldom attended with pain in the beginning, contrary to what happens in the hernia of the epiploon, and of the inteſtine; nor is it often the effect of any accident. It never diminiſhes when once begun, but generally continues to increaſe; but in ſome perſons not ſo quick as in others. In one perſon it will grow to a very painful diſtenſion in a few months; in another it ſhall not be troubleſome in many years; nay, it ſhall ceaſe to ſwell at a certain period, and afterwards continue in that ſtate without any notable diſadvantage. But this is rare.

In proportion as it enlarges, it becomes more tenſe, and then is ſaid to be tranſparent: but this is not always the caſe; for ſometimes the ſcrotum is very much thickened, and the water itſelf opake; ſo that to judge poſitively if there be a fluid, we muſt be guided by feeling a fluctuation; and though ſometimes it is not very evident, yet we may be ſure there is a fluid of ſome kind, if we are certain that the diſtenſion of the tunica vaginalis makes the tumour.

When a gut, or the omentum, form the ſwelling, it is ſoft and pliable, unleſs inflamed, and uneven in the ſurface, and reaches from the ſcrotum into the very abdomen; whereas the hydrocele is tenſe and ſmooth, and ceaſes before, or when it arrives at the rings of the abdominal muſcles.

When the teſticle is increaſed in ſize, the tumour is rounder, and, if not attended with an enlargement of the ſpermatic veſſels, the cord may be eaſily diſtinguiſhed between the tumour and the abdomen; but without this the pain or the very great hardneſs will diſcover it to be a diſeaſe of the teſticle.

As to the cure, little is to be expected either from inward medicines or outward applications. Therefore it will be moſt adviſeable to wait till the tumour becomes troubleſome, and then to tap it with a lancet.

Of the JAUNDICE.

THE jaundice is a diſeaſe which is principally diſcovered by the yellow tincture of the ſkin, but moſt diſtinctly in the coats of the eyes, where it gives the firſt notice of its invaſion.

The ſymptoms are, heavineſs, inactivity, laſſitude of the whole body, anxiety, uneaſineſs about the hypochondria, ſickneſs at the ſtomach, oppreſſion in the breaſt, difficult reſpiration, a dry and harſh ſkin, coſtiveneſs, hard white excrements, yellow high-coloured urine, which will tincture linnen or paper with a ſaffron hue; there is a bitter taſte in the mouth; and all objects ſeem to be diſcoloured.

The immediate cauſe of a jaundice is an obſtructed excretion of the bile from the veſica felis and liver into the duodenum; which being forced back upon the liver, mixes with the blood, by which it is carried into the whole body, whence the ſkin and urine will be tinctured with the colour of the bile.

This obſtruction may be occaſioned by any thing in the duct, which plugs up the paſſage, or by external preſſure cloſes its mouth, or by a ſpaſm contracting the fibres thereof. Hence we may conceive why the jaundice ſucceeds the ſtatulent colic, why pregnant women

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are ſubject to this diſeaſe, and why ſpaſms of hypochondriacal and hyſterical perſons produce the ſame effect. Sudden frights, the generation of too great plenty of bile, ſchirrhous tumours or ulcers of the liver, obſtructions of the menſes, obſtinate intermitting fevers, and the bites of venomous animals, will alſo produce this diſeaſe.

The prognoſtics of this diſeaſe differ with regard to the patient's age, habit, ſtrength, and conſtitution, as well as with reſpect to the virulence or mildneſs of the cauſes, and its duration. When the patient is young, and the diſeaſe not complicated with any other, ſuch as a quartan ague, the affectio hypochondriaca, or an obſtruction or ſcirrhus of the liver, and has not continued long, it is eaſily cured. But if after the cure it frequently returns, with a yellow greeniſh colour, and an induration of the liver, it generally terminates in a hectic or an hæmorrhage. A jaundice ariſing from violent tranſports of anger, or the ſpaſmodic ſtricture of the inteſtines or biliary ducts, cauſed by a draſtic purge or emetic, is eaſily cured if taken in time; but if encouraged by grief, or the body is weakened by a previous diſorder, the cure is more difficult.

Emetics are highly proper in the cure of the jaundice, and yield ſpeedy relief, if the diſeaſe does not proceed from violent anger, ſpaſms of the ſtomach, a cardialgia, a ſpaſmodic colic, or a ſtone lodged in the cyſtic duct, exciting a violent uneaſineſs about the præcordia. But when a bilious ſordes, lodged in the duodenum, and cloſing up the orifice of the ductus choledochus, intercepts the paſſage of the bile; or when a tenacious, moveable, and not highly concreted bilious matter, plugs up the hepatic ducts, emetics are of ſingular efficacy in evacuating it. A ſcruple of ipecacuanha, with a grain of tartar emetic, will be a proper doſe; or two grains of tartar emetic, in a draught of generous wine, or in an infuſion of manna, drinking water-gruel after it.

Likewiſe in this caſe, after emetics, cathartics will be proper, compounded of aloetics and mercurials: Then ſaponaceous attenuants, preparations of tartar, and volatiles.

And here we muſt recommend the terra foliata tartari, otherwiſe called tartarum regeneratum, [and by the college, Sal diureticus,] as the greateſt diſſolvent, and the moſt powerful remedy in this diſeaſe. It diſſolves the moſt tenacious ſubſtances, and opens all obſtructions of the viſcera; and yet has no acrimony, and may be ſafely given in the pleuriſy and dropſy. Its doſe is from five grains to a ſcruple and upwards.

When a jaundice is attended with an hæmorrhage, it is always dangerous, becauſe it denotes a moſt acrimonious and diſſolved ſtate of the blood; in which caſe, attenuants, aloetics, volatiles, and chalybeates, are little better than poiſon; whereas acids, diluents, demulcents, and mineral waters, are very beneficial. Hemp-ſeed, boiled in milk till it breaks, is often advantageous, [the doſe is 5 ounces twice a-day,] or an emulſion of white poppy ſeeds and ſweet almonds, after moderate bleeding, (if the patent is feveriſh, and the pulſe will allow it) and gentle purging.

Of the Bilious Colic.

A Bilious colic is attended with the following ſymptoms; a hoarſe voice, a cardialgia, a continual loathing of victuals, a vomiting of bilious poraceous matter, hiccup, a feveriſh heat, inquietude, intenſe thirſt, a bitter taſte in the mouth, and the urine little and high-coloured. Hoff. Add to theſe, a burning, acute, continual pain about the region of the navel, which either ſeems to bind the belly as it were with a girdle, or is contracted into a point as if the patient was bored through, which ſometimes remits, and then grows more violent. In the beginning it is not ſo much determined to one point, nor is the vomiting ſo frequent, nor does the body ſo obſtinately withſtand the force of cathartics. But as the pain increaſes, the more it is fixed to a point, the vomiting is more frequent, the body more coſtive, till at length it terminates in the iliac paſſion. At this time the pain is ſo intenſe as to occaſion a ſingultus, a delirium, coldneſs in the extremities, and chilling, clammy ſweats, which are always a dangerous omen in this diſeaſe.

It is diſtinguiſhed from a fit of the gravel, as the pain in this lies in the kidney, and is extended from thence by the ureter to the teſticle; after eating, the colic pain increaſes, the nephritic abates; evacuations upward or downwards relieve the colic more than a fit of the gravel. The urine in the latter is more clear and thin at firſt, afterwards there is a ſediment, and at length gravel or ſmall ſtones; whereas in the colic the urine is more thick in the beginning.

Bleed freely in the arm; and after three or four hours exhibit an anodyne, and the next day a gentle cathartic, which may be repeated every other day, to the third time.

Sydenham recommends riding, eſpecially when the cure is only palliated with opiates.

If the diſeaſe is cauſed by a plentiful eating of ſummer-fruits, the patient ſhould drink poſſet-drink plentifully, then take an anodyne, and bleed the next day.

Ruſſel obſerves, that when the colic proceeds from coſtiveneſs without a fever, then a pint of ſea-water, drank every morning, will cure it But if the firſt onſet of the diſeaſe is neglected, and it proceeds to an inflammation, with a fever, vomiting, and retention of the excrement, and there is reaſon to be apprehenſive of the iliac paſſion; when black vomiting ſupervenes, and the fæces are thrown up by the mouth; as alſo when there is a quick weak pulſe, and cold ſweats ſupervene; then the patient will be carried off by a mortification. Sometimes after the rigors, pus will ſhow itſelf in ſome place or other, which prevents immediate death; while a purulent teneſmus afflicts the unhappy patient.

Of the Hysteric Colic.

This is a common ſymptom of the hyſteric paſſion, and is attended with a moſt violent pain about the pit of the ſtomach, as alſo with a vomiting of a greeniſh humour, and a great ſinking of the ſpirits: After a day or two the pain goes off, but upon the ſlighteſt motion or perturbation of the mind it ſoon returns again.

Neither

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Neither bleeding nor cathartics have any place in the cure, for they exaſperate the diſtemper; nay, the moſt gentle clyſters are prejudicial: For this diſeaſe ſeems rather to proceed from a diſorder of the ſpirits, than from a fault of the humours. It will be proper firſt to adviſe the patient to drink upwards of a gallon of poſſet-drink, to clear the ſtomach of its impurities, by throwing it up again, that the effects of the paregoric may not be hindered. Afterwards give 25 drops of the thebaic tincture, in an ounce of cinnamon-water. This laſt is to be repeated at due intervals, till the ſymptoms diſappear; that is, the effect of one doſe muſt be known, before another is given. Yet ſometimes, in plethoric bodies, if the ſtrength will permit, it is better to prepare the way, by bleeding and purging, or both, for an anodyne.

Of the FLATULENT *or* WIND COLIC.

If there is a fixed and tenſive pain in the right or left hypochondrium, or beneath the ſtomach, it is a certain ſign that there is wind or excrements pent up in the flexures of the colon. If the pain is in the ſmall guts, the abdomen will be wonderfully ſwelled and puffed up; and the force of the wind is often ſo great, and it diſtends the ſkin to ſuch a degree, that the pain is exaſperated merely by touching it; nor do there want inſtances of a navel-rupture ariſing therefrom. The pains are very acute, the body extremely coſtive, there is a ſenſe of a very great ſtraightneſs or contraction; and if the ſtomach is inflated, the breathing becomes very difficult, and the eructations are attended with ſome ſmall relief. Afterwards there are cardialgic paſſions, and an ineffectual reaching to vomit.

If the diſorder lies in the flexures of the colon, emollient and diſcutient clyſters will be proper, as alſo carminative and emollient liniments applied to the pained part.

When the body is opened, it will be beneficial to give ſome lenient purge, as manna, cream of tartar, terra foliata tartari, with a ſpoonful or two of oil of ſweet almonds.

While the pain is violent, the infuſion of chamomile flowers and yarrow, in the manner of tea, frequently drank, is a very powerful remedy.

It will be alſo beneficial to apply hot bricks or tiles to the part affected; alſo bags with parched oats and carminative ingredients, as carraway ſeed, juniper and bay berries, with decrepitated ſalt. A clyſter of the ſmoak of tobacco, blown through a pipe into the anus, is reckoned an excellent thing.

When indurated feces plug up the inteſtinum rectum, ſo that the wind and ſcybals can make no exit, then the anus is to be fomented with emollient decoctions; and ſaline ſuppoſitories, with fat, are to be uſed; alſo ſome ounces of linſeed oil, with an emollient decoction in which venice ſoap has been diſſolved, are to be injected as a clyſter

Of the COLIC *from Fumes of Lead.*

THIS is a diſeaſe to which all workers in lead are ſubject; and is attended with an intolerable pain in the inteſtines, and a moſt coſtive body: the navel is drawn inward, there is the higheſt inquietude and a contraction of the joints, attended with a nauſea, and a conſtant reaching to vomit. It is apt to terminate in a kind of palſy, or a ſpaſmodic aſthma, and afflicts the patient a long time. It is ſometimes owing to the raſhneſs of medicaſters, in giving preparations of lead in the gonorrhœa and other diſtempers.

There is no better preſervative againſt this diſeaſe, than by taking fat broth in a morning; the cure is to be attempted with oleous clyſters, and a plentiful uſe of oil of ſweet almonds taken by the mouth, with or without a ſolution of manna, by which the deſired end will generally be obtained. For the cure for the pareſis, baths of ſweet water are neceſſary; after which the ſpine of the back muſt be anointed with a liniment made of the fat of a hog, expreſſed oil of nutmegs ſaffron, and oil of roſemary, which is a ſpeedy and a certain remedy.

This diſeaſe is called mill-reek by the miners at lead-hills in Scotland, which all the inhabitants there are ſubject to; but melters of lead have it with the greateſt violence.

In the ſlighter ſtage of it, there is an uneaſineſs and weight about the ſtomach, particularly near the cartilago enſiformis, and ſometimes it is like a colic in the inteſtines. The ſpittle of the patient is ſweet, and inclining to a bluiſh colour, reſembling that of a perſon who chews lead. The pulſe is lowiſh, and the ſkin is all over cold, with frequent clammy ſweats. The legs become feeble, with a pricking numbneſs; and the whole body is lazy and feeble. Sometimes a ſpontaneous diarrhœa carries off the diſeaſe; but if it continues long, it is very prejudicial. During this ſtage the patient is able to work.

When theſe ſymptoms continue long, and ſpirituous liquors are drunk on an empty ſtomach, or after the working of lead, the ſecond ſtage comes one; and then there is a fixed pain in the ſtomach and guts, eſpecially in the lower part of the belly, extending from one hip-bone to the other, with coſtiveneſs and a gnawing pain. The pulſe then becomes weak, and the ſkin hot. There is likewiſe a giddineſs and a violent pain in the head, which is ſucceeded by an inſenſibility and a delirium of the worſt kind; for they bite their hands and tear their own fleſh. Then their extremities tremble with convulſions; and at length they ſink with an intermitting pulſe, and die of a coma or apoplexy.

If proper medicines are given in the firſt ſtage of the diſeaſe, the patient generally recovers. If it proceeds till the giddineſs comes on, the ſucceſs is doubtful; but after that it almoſt always proves mortal.

Workers in lead ſhould never go to their buſineſs faſting, and their food ought to be oily or fat. A glaſs of ſalad oil, with a little brandy, rum, or other ſpirit, is a good morning's draught; but ſpirits alone ſhould never be taken while at work, nor immediately after it. Phyſick ſhould be taken ſpring and fall, and no man ſhould go into the cold air while hot with labour, and they ſhould change their working-cloaths for others as ſoon as poſſible. Liquid aliment is beſt, ſuch as fat broth with good meat; for low living is bad. They ſhould now and then go a little way out of the tainted air.

If the patient is plethoric, the cure is to be begun with

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bleeding, and then the *primæ viæ* muſt be cleanſed with a double doſe of emetic wine, or emetic tartar, otherwiſe it will have no effect. They will even bear half a dram of glaſs of antimony in fine powder, with plenty of warm water during the operation. If the vomit works well upwards and downwards, the patient is in a fair way of recovery Then a milder doſe of ipecacuanha muſt be given with tartar emetic. If the doſe does not work either way, he is generally the worſe for it, and a ſtronger doſe ſhould be given ſoon after. If it vomits, but does not purge, an antimonial cathartic, or jalap and mercury ſhould be exhibited in a larger quantity than ordinary, and then the patient ſhould drink plentifully of warm broth The vomits and purges ſhould be repeated at proper intervals till the diſeaſe diſappears. If they work too much. an opiate may be given at night, but with caution, for fear of rendering the patient coſtive, which is the worſt thing that can befal him. When purgatives do not operate ſufficiently, emollient, laxative, and anodyne clyſters muſt be injected frequently to empty the guts.

Of the Iliac Paſſion.

The iliac paſſion is a pain in the ſmall inteſtines, apt to turn to an inflammation, in which their periſtaltic motion is inverted, and their contents, and even the excrements themſelves, are voided by the mouth in vomiting. Nothing will paſs downward, not ſo much as a flatus.

It is preceded with coſtiveneſs, which is ſoon followed with moſt ſharp and violent pains, with an inflammation, diſtenſion and a tumour of the umbilical region, which feels hard to the touch; the body is ſo bound, that neither wind nor excrements can paſs downward: Soon after, the wind firſt makes its way upward, then comes on a nauſea and a frequent vomiting of a bilious and pituitous matter: The breathing grows difficult, and whatever is eat or drank is ſoon thrown up again; reddiſh fæces, with a ſtinking ſmell, are afterwards forced up by vomiting: This is ſucceeded by loſs of ſtrength, a preternatural heat, a hard and contracted pulſe, with great thirſt; the urine is red, and voided with difficulty. When the caſe becomes deſperate, a hiccup and delirium appear; the nerves are diſtended, the body is all in a cold ſweat, and violent convulſions and fainting fits put an end to the tragedy.

In ſome who have been diſſected, the gut ſeemed to be twiſted; but moſt commonly one part of the gut enters into the other. This diſeaſe may alſo proceed from a rupture either of the ſcrotum or the groin; from poiſons; from any thing that ſtops up the paſſage through the ſmall guts, ſuch as hard dry food, quinces, pears, unripe acerb fruit, when eaten in large quantities; to which drinking little, a ſedentary life, and a melancholy diſpoſition of mind, will greatly contribute. Theſe all tend to harden the fæces. The groſs inteſtines may alſo be plugged up with ſcybals; eſpecially if a perſon, either through ſhame, or for want of conveniency, does not liſten to the calls of nature.

As to the prognoſtics; there is hope of recovery while there is no inflammation, and while clyſters are admitted into the body, and rendered back the ſame way; as alſo while the pain ſhifts from one place to another, and the pain and vomiting are not continual; likewiſe when the diſeaſe proceeds from fæces obſtructing the inteſtines. The hope is ſtill greater, if laxative medicines begin to make their way downward. But if there is an inflammation, which is known from a fever, the vehemence of the pain, a ſuppreſſion of urine, a hard and quick pulſe, an unquenchable thirſt, a toſſing of the body, and extreme debility, with coldneſs of the extreme parts, the caſe is deſperate. A ſudden ceſſation of pain, and abſolute want of ſtrength, with a weak pulſe, fainting fits, and a ſtinking breath, ſhew the inteſtines are mortified.

As to the cure; firſt of all it is neceſſary to bleed in the arm, and afterwards, in an hour or two, exhibit a a powerful clyſter. The ſmoke of tobacco blown into the bowels, through an inverted pipe, is very efficacious: This may be repeated after ſome time, unleſs the effect of the firſt renders it unneceſſary If the diſeaſe will not yield to this, a pretty ſtrong cathartic is adviſeable.

If the patient cannot retain the cathartic, let him take 25 drops of the thebaic tincture in half an ounce of ſpiritous cinnamon water; and when the vomiting and pain remit, let the cathartic be repeated; if the pain returns, give the anodyne again, and repeat it every fourth or ſixth hour till the inteſtines are eaſy, and the cathartic begins to paſs downwards.

After the pain has been mitigated with anodynes, a cataplaſm ſhould be applied to the hypogaſtric region to ſtop the vomiting and hiccup; which may be compoſed of equal parts of old venice treacle and expreſſed oil of nutmegs, with the addition of oil of mint and camphor. This done, a gentle laxative of manna, cream of tartar, and oil of ſweet almonds, may be given.

When there is an inflammation, nothing is better than ſix or eight grains of purified nitre, and half a grain of camphor mixed with ſome antiſpaſmodic powder, and taken in a convenient vehicle. Outwardly apply a liniment of an ounce of axungia humana, [any other penetrating fat will do as well] and a dram of camphor.

But when other things fail in the cure of the iliac paſſion, recourſe muſt be had to quickſilver, which ſometimes has ſurpriſing effects; half a pound, or a pound at moſt, is ſufficient, with fat broth or oil; and the patient ſhould lie on his right ſide, or walk gently about the room, that its deſcent may be eaſier. But if there is an actual inflammation, the uſe of quickſilver ſhould be forborne; if the patient dies, from what cauſe ſoever, the byſtanders will probably affirm the quickſilver killed him.

There is no manner of danger in the uſe of opiates, to mitigate the pain, provided they are exhibited in the beginning, after bleeding, or before there are any ſigns of a mortification.

Clyſters are generally very advantageous; for they relax the ſpaſms of the groſs inteſtines: and for this purpoſe warm water with ſyrup of marſhmallows will be ſufficient; and if the ſtrength will permit, they ſhould be injected every two hours, from the firſt day of the attack. They likewiſe reſtrain the inverſion of the periſtaltic motion, and ſoften the fæces.

Of

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Of VOMITING.

Vomiting is a ſpaſmodic, retrograde motion of the muſcular fibres of the oeſophagus, ſtomach and inteſtines, together with ſtrong convulſions of the abdominal muſcles and diaphragm. Thoſe that are ſlight, create nauſeas; thoſe that are ſtrong, vomiting.

Vomiting generally begins with a nauſea, a tenſion and weight in the epigaſtric region, a bitterneſs in the mouth, anxieties of the præcordia, plenty of thin ſaliva in the mouth, a trembling of the neither lip; to theſe may be added a dizzineſs of the head a ſudden dimneſs of ſight, redneſs of the face, a fruitleſs eructation and then the contents of the ſtomach are diſcharged upwards.

Vomiting is cauſed by exceſſes in eating and drinking; by the acrimony of the aliments; by the tranſlation of the morbific matter of ulcers, the gout, eryſipelas, and other diſeaſes, to the ſtomach; from a looſeneſs or bloody flux too ſuddenly ſtopped; from a congeſtion of blood in the ſtomach which happens to women in the firſt months of pregnancy, or when there is a ſuppreſſion of the menſes, or bleeding piles; from ſympathy, by tickling or irritating the throat or œſophagus with the finger or a feather; from the colic, iliac paſſion, a rupture, fit of the gravel, worms; from poiſons; from hurts of the brain, ſuch as contuſions compreſſions, wounds or inflammations of the diaphragm, ſtomach, inteſtines, ſpleen, liver, kidneys, pancreas or meſentery; from an unuſual motion of the ſpirits in a cart, coach, or ſhip; from the idea of ſome nauſeous thing, or which has formerly occaſioned ſickneſs or vomiting; from a regurgitation of bile into the ſtomach.

As to the prognoſtics; a critical vomiting is ſalutary; a ſymptomatic bad; and that which proceeds from a ſubtil cauſtic acrimony, which vellicates the nerves, worſt of all. All violent exceſſive vomiting is bad, as it may occaſion abortions, ruptures, *&c.* Bilious vomiting, eſpecially the green, porraceous, and æruginous, conſiſting of a corroding acid, portends danger of an inflammation; vomiting from worms which gnaw the ſtomach, is generally pernicious; vomiting of dead worms if at the ſame time the convulſions of the limbs and other grievous ſymptoms ſuddenly ceaſe, ſhews a mortification. All fætid vomiting is a ſign of internal corruption, and therefore bad.

When vomiting proceeds from crapula, late ſuppers, diſturbed digeſtion by riding, and the like, it may be prevented by deep inſpirations often repeated, by which the diaphragm is made to preſs on the ſtomach, and accelerate the diſcharge of it contents; but if an inclination to vomit, from the ſame cauſes, comes on unawares, a pretty ſtrong and often repeated friction of the hypogaſtric region with the hand, will prevent it.

Pituitous vomiting, from crudities of the primæ viæ, is beſt cured by a vomit, and eſpecially if there is a troubleſome reaching to vomit; attended with a nauſea and a cardialgia; then having firſt preſcribed neutral ſalts, or ſquills, to incite the phlegm, give warm water mixed with unſalted butter, very plentifully, or powder of ipecacuanha.

Bilious vomiting, which proceeds from a depraved digeſtion, and has its ſeat in the duodenum, is cured by abſorbents and gentle laxatives of manna and rhubarb. When it proceeds from too great a laxity of the biliary ducts, then cortex Peruvianus, cortex eleutheriæ, and bitter tinctures and chalybeates, will be moſt efficacious; if from a coagulum or ſtone in the gall bladder, mineral waters are more likely to ſucceed.

When vomiting is cauſed by a ſharp matter vellicating the nerves of the ſtomach, proceeding from the gout, or an eryſipelas, beſides giving quieting medicines, it ought to be drove back by diaphoretic powders, with a ſmall addition of camphor. Alſo externally, frictions, pediluvia, and clyſters, are uſeful.

When it proceeds from poiſons, nothing is better at the beginning than drinking large quantities of milk, and fat oily things, to ſheath their acrimony, and bring them up by vomiting.

Vomiting from a ſuppreſſion of the menſes, or from the ſtoppage of the bleeding piles, is cured by abſorbents, by gentle laxatives, by clyſters and ſtrengtheners; and more eſpecially by bleeding or cauſing the flux to return. Emetics, in this caſe, are as bad as poiſon, and either cauſe a vomiting of blood, or a fatal inflammation of the ſtomach.

Morning reachings, cauſed by hard drinking, are cured by abſorbents and anti-acids, and by ſtrengthening the digeſtive faculty, by bitters, candied orange-peel, *&c.*

The immoderate and frequent vomiting of pregnant women requires bleeding in the foot, and reſt both of mind and body.

Of the VOMITING *of* BLOOD.

VOMITING of blood is generally preceded with a tenſive pricking pain in the left hypochondrium; and the eruption itſelf is almoſt always attended with anxiety of the præcordia, and a compreſſing pain as alſo a kind of girding on the ſame ſide. It is frequently attended with fainting fits, eſpecially if the blood has an ill ſmell, or is corrupted.

The ſeat of this diſeaſe is in the ſtomach, though the ſpleen ſometimes has a ſhare in its production.

Perſons more ſubject to it are the lean and ſlender; women irregular in their menſes, and who have been haſtily cured of intermitting fevers, which has brought on a ſuppreſſion of the menſes, and then have taken hot forcing emmenagogues; as alſo women about the time their menſes leave them; likewiſe plethoric women in the time of pregnancy, and hard labour; and men of a weak conſtitution, ſubject to the bleeding piles, which either ceaſe to flow, or flow in too ſmall a quantity.

The danger which attends this diſeaſe, is not the ſame in all, though no hæmorrhage is more dangerous than this. If there is no fever, and if it proceeds from ſuppreſſed evacuations cauſed by a plethora, the caſe is not ſo deſperate. On the contrary, if there is a fever; if the blood is corrupted, ſtinking, and black; if it proceeds from a large, diſeaſed ſpleen, or an indurated liver, attended with ſwooning; there is no hope of recovery left. It is ſtill worſe, when the ſtools are black; then the ſeat of the diſeaſe is in the ilium, from a rupture of the meſaraic veſſels.

In the paroxyſm, if the patient is plethoric, bleed according to his age and ſtrength.

When

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When there is an orgaſm in the blood, and the pulſe is impetuous and ſtrong,

Take a pound of water, a dram of nitre, and half an ounce of ſyrup of wild poppies.

This, taken ſucceſſively and temperately, will be very efficacious in perfecting a cure.

When the region of the præcordia, eſpecially on the left ſide, is afflicted with pricking and vellicating pains, and ſpaſmodic ſtrictures, together with heat and thirſt, emulſions will be proper. Theſe muſt be made with the four cold ſeeds, and white poppy ſeed; to which muſt be added a little nitre, and a proper quantity of diacodium.

Likewiſe, in order to relax the ſpaſmodic ſtrictures of the inteſtines, and to divert the flux of the humours from the part affected, emollient clyſters, frequently injected, will be proper, with a gentle ſtimulus, and the addition of nitre.

Outwardly, to relax the ſpaſms and ſtrengthen the ſtomach, nothing is better than the oil of camphor; which is made by diſſolving a dram of camphor in an ounce of oil of ſweet almonds, and then by adding twenty drops of oil of rhodium. Let the region of the præcordia and the left hypochondrium be anointed with this oil; and afterwards lay a bag on the part affected, filled with camomile and elder-flowers, with mint and wormwood, boiled in vinegar of roſes or red wine pretty hot.

If blood is thrown up in great quantity, with loſs of ſtrength, ligatures made upon the joints may be ſerviceable, as alſo putting the legs and arms in cold water.

When the paroxyſm is off, half a dram of rhubarb will be highly beneficial, either with or without teſtaceous powders; or twelve grains of compound powder of amber, with half a grain of camphor taken twice a-week, at night going to bed, in a draught of ſpring water. Rhubarb is a kind of a ſpecific in opening obſtructions. The patient, inſtead of tea, may drink a decoction of yarrow, liquorice, and fennel-ſeeds. The common drink may be ſpring water, in which iron has been quenched, or acidulated whey.

If this diſeaſe proceeds from a ſuppreſſion of the menſes; bleed in the foot, and give clyſters prepared of mugwort, pennyroyal, wall-flowers, bay and juniper-berries, pretty frequently.

If it is cauſed by ſharp acid liquors corroding the veſſels of the ſtomach, then teſtaceous alkaline powders are proper; and ſtarch boiled in milk will heal the veſſels.

Opiates muſt be ſhunned in theſe caſes, becauſe they bring on great weakneſs and loſs of ſtrength, to the great detriment of the patient. Likewiſe all ſtyptics, aſtringents, and vitriolic medicines, muſt be ſtudiouſly avoided: theſe, indeed, will ſtop the eruption of blood; but then it will ſtagnate and putrify in the veſſels, with danger of an inflammation and mortification; or at leaſt, if the patient is cachectic, it will haſten a dropſy.

Of a DIARRHOEA, *or* LOOSENESS.

A DIARRHOEA is a frequent and copious evacuation of liquid excrements by ſtool; and may proceed from aliments, or humours of various kinds, derived from different parts into the inteſtines.

The cauſe is a ſtimulus which irritates the viſcera, occaſioning the expulſion of their fluids; and may therefore proceed from the veſſels of the liver, pancreas, meſentery, and inteſtines; when at the ſame time the mouths of the meſenteric veins and the lacteals are obſtructed. Or there may be an extraordinary laxity of the inteſtinal fibres; or, laſtly it may ariſe from a ſtoppage of other excretions. It is frequently attended with gripings. The patient is weak, makes but little urine, has a depreſſed pulſe, a depraved appetite, and is ſometimes feveriſh.

In a diarrhœa ariſing from ſharp fermenting juices in the *primæ viæ*, which accelerate the periſtaltic motion of the inteſtines, the firſt indication is to diſcharge the ſtimulating matter; which may be effected by a doſe or two of rhubarb.

At night the patient may take fifteen drops of the thebaic tincture, in two or three ſpoonfuls of ſimple cinnamon water. The rhubarb is to be repeated till the looſeneſs abates, which is generally after the ſecond doſe.

If there is a ſaburra of ill-concocted matter in the ſtomach, a vomit will be neceſſary of ipecacuanha, [or an ounce of its wine]

If the diarrhœa continues to be violent, it will be proper to mix aſtringents with the rhubarb.

If the diarrhœa proceeds from ſuppreſſed perſpiration; and if the ſtools are thin, and the patient feveriſh; firſt bleed, then give an emetic, afterwards a purge of rhubarb, and laſt of all aſtringents.

But the beſt and ſafeſt aſtringent of all is logwood, given in decoction.

A bilious diarrhœa ought not to be too ſuddenly ſtopped, but the humours are to be corrected gradually; for which purpoſe, a ſcruple of rhubarb ſlightly toaſted, with a few grains of nitre, is very uſeful. Likewiſe half a dram of the expreſſed oil of nutmegs, either alone or mixed with a grain of opium, and given in broth, is very efficacious. The humours are likewiſe corrected with thin emulſions of almonds and white poppy-ſeeds, with the addition of diacodium.

When a diarrhœa is very obſtinate, after toaſted rhubarb has been given for ſome days, preſcribe a ſweat with a dram of new venice treacle, and twelve grains of burnt hartſhorn, calx antimon. and purified nitre.

An habitual diarrhœa is greatly relieved by wearing a flannel ſhirt, and keeping the body warm.

In Vol. I. of the *London Medical Obſervations and Inquiries*, Dr Pye proves, by a long enumeration of inſtances, that in all looſeneſſes where emetics are adviſeable in every age and ſex, though the patient be in the weakeſt circumſtances, ipecacuanha, from half a grain, to four or ſix grains, may be given with the utmoſt ſafety, and will ſeldom fail of anſwering the intention of the preſcriber; and adds, that for many years he had experienced the great efficacy of it, in curing or aſſiſting in the cure of diarrhœas in children, when adminiſtered in clyſters.

Of

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Of the CHOLERA MORBUS, *or* VOMITING *and* LOOSENESS.

A CHOLERA, or vomiting and looſeneſs, is a ſudden violent purging upwards and downwards, proceeding from a convulſive contraction of the ſtomach and inteſtines, cauſed by ſharp cauſtic matter of various kinds.

It generally begins in Auguſt, and ſeldom reaches the firſt weeks of September, unleſs it be a ſpurious kind which ariſes from exceſs.

It diſcovers itſelf by enormous vomiting, and a voiding of vitiated humours by ſtool. There is a violent pain, inflation and diſtention of the belly and inteſtines, as alſo a cardialgia and thirſt; the pulſe is quick and frequent, ſmall and unequal; there are heat and anxiety, a moſt troubleſome nauſea, ſweating, a contraction of the legs and arms, fainting, coldneſs of the extreme parts, and the like, which kill the patient in twenty-four hours.

Though this diſeaſe is generally preceded with acid, nidorous belchings, pungent and cardialgic pains in the ſtomach and inteſtines; yet ſoon after, all of a ſudden, and at the ſame inſtant, the vomiting and looſeneſs make their attack. The remains of the laſt meal are voided firſt; afterwards bilious humours, mixed more or leſs with mucus; then thoſe that are yellow, then eruginous, then black, often exceeding acid, and almoſt corroſive, together with frequent eructations and wind, and ſometimes blood itſelf. The returns of the evacuations are very frequent. Beſides, there are moſt acute, wringing, griping, gnawing, biting pains, with inflation and rumbling of the inteſtines, chiefly above the navel, and moſt racking cardialgias. As the diſeaſe increaſes, the thirſt becomes great, the extreme parts grow cold: there is a palpitation of the heart, and then hiccups; the urine ſtops, and the body is covered with a cold ſweat. It is common for the patient to ſwoon away, and to fall into terrible convulſions.

There is no diſeaſe, except the plague and peſtilential fevers, that kills ſooner than this, eſpecially if it attacks old perſons, or children, or ſuch as are weakened with diſeaſes. The more cauſtic the matter is which is voided, the more intenſe are the thirſt and heat, and the more certain the danger. If it be black bile, and mixed with black blood, death is inevitable. The caſe is as bad when there are faintings, hiccups, convulſions, coldneſs of the extreme parts, and cold ſweats. Nor is any thing better to be expected from a ſtoppage of the evacuations, while the reſt of the ſymptoms continue. But if the vomiting ceaſes, and the patient ſleeps ſoon after, or the diſeaſe is protracted beyond the ſeventh day, he may recover; if he begins to break wind downward, it is a good ſign.

This diſeaſe requires the moſt ſpeedy aſſiſtance, and therefore the phyſician cannot be called too ſoon. The indications of cure are, 1. To correct and ſheath the morbific matter, and to fit it for evacuation. 2. To appeaſe the irregular ſpaſmodic motions. 3. To ſtrengthen the nervous parts which the diſeaſe has weakened.

Boil a large chicken in three gallons of water, that ſo there may be ſcarce any taſte of the fleſh and give the patient a large quantity of it to drink; or, for want of it, warm poſſet-drink; and alſo repeated clyſters of the ſame liquor; now and then an ounce of ſyrup of violets may be added to the draught or clyſter. Theſe operations may be compleated in three or four hours, and then a paregoric will crown the whole.

But if the phyſician is not called in time, and the patient has been exhauſted with vomiting and purging for many hours, and the extreme parts begin to grow cold, then immediate recourſe muſt be had to liquid laudanum in a large doſe. And when the ſymptoms ceaſe, it is to be repeated morning and evening, till the patient's ſtrength returns.

Neither cathartics nor emetics, properly ſpeaking, are of uſe in this diſeaſe; but the vomiting may be promoted by drinking a large quantity of warm water mixed with freſh butter or oil; and the purging by oily and emollient clyſters. Or the patient may drink ſmall chicken-broth. Whey is of great uſe to quench the thirſt; to which may be added, the abſorbent and teſtaceous powders.

If the patient is not too much exhauſted, make him drink plentifully of warm water three or four times, to dilute and blunt the acrimony of the humours, and to bring them up by vomit: Then he muſt take as freely of a decoction of oat-bread, baked without leaven or yeaſt, carefully toaſted, without burning, as brown as coffee; which decoction ought to be of the colour of weak coffee. This is grateful to the ſtomach, and is ſeldom brought up again.

When the patient is much exhauſted with evacuations upwards and downwards, give him a large draught of the decoction; and, when the nauſea is pretty well ſettled, two thirds of a grain of opium, more or leſs, according to the ſtrength and age of the patient.

But if the patient is convulſed, the extreme parts cold, and the pulſe weak and intermitting, twenty-five drops of liquid laudanum, in an ounce of ſtrong cinnamon water, is more proper; and afterwards a draught of any wine in an equal quantity of the decoction. After this, he may take the decoction to quench his thirſt, and a little wine now and then as a cordial.

To prevent a relapſe, repeat the opiate in a moderate quantity for ſome days, morning and evening; and care muſt be taken not to overload the ſtomach, or to eat any thing but what is of good nouriſhment, eaſy to digeſt, and grateful to the ſtomach.

Of the DYSENTERY, *or* BLOODY-FLUX.

A DYSENTERY begins with ſhivering and ſhaking, ſucceeded by heat of the whole body; which are followed by griping of the guts, and ſoon after by frequent voiding of ſlimy ſtools, attended with violent pain, and a moſt troubleſome preſſing down or ſeeming deſcent of all the bowels, and this every time the patient has a ſtool. In proceſs of time the ſtools are mixt with blood, and afterwards pure blood is only evacuated, and the inteſtines are affected with an incurable gangrene. Yet ſometimes there has been no blood through the whole progreſs of the diſeaſe.

If the patient is in the flower of his age, or has been heated with cordials, he is very feveriſh, his tongue is whitiſh,

whitiſh, and beſet with a thick mucus; ſometimes it is black and dry; he becomes exceſſively weak, and is quite deſtitute of ſpirits; aphthæ or a thruſh appear in his mouth and throat, eſpecially if the evacuation of the morbific matter has been prepoſterouſly prevented by aſtringents, and the fomes of the diſeaſe has not been expelled by cathartics. Sometimes, when a fever is abſent, the gripes lead the van, and the reſt of the ſymptoms follow.

Thoſe whoſe ſtomachs are loaded with much indigeſted matter, are troubled with a nauſea, reachings and vomiting; many have an intolerable heartburn and anxiety of the præcordia. All are afflicted with a perpetual deſire of going to ſtool, and ſuch a violent teneſmus as is not ſeldom attended with a procidentia ani.

In ſome, the extreme parts are cold, while the inward ſeem to burn, and a perpetual ſenſe of heat and a pulſation torture the inteſtines. To theſe ſucceed hiccups, cold ſweats, a pale countenance, waſting of the body, inflammations, and aphthæ of the fauces. At laſt, all pain ceaſes at once, the thirſt vaniſhes, the ſtools come away inſenſibly with a cadaverous ſtench, the pulſe becomes ſlender, and death is at hand. This diſeaſe is often contagious.

Prognoſtics. Dyſenteries are dangerous to pregnant women, to old men, and to boys. There is commonly little hope when it attacks the ſcorbutic, the conſumptive, and the cachectic; thoſe that are weak and afflicted in mind, or troubled with worms. When it begins with vomiting, ſucceeded with hiccups, there is danger of an inflammation of the ſtomach. Nor is the caſe better when the ſtools are green, black, mixed with caruncles, and of a noiſome ſtench. It is a fatal omen when clyſters are immediately returned, or the anus ſo obſtinately cloſed that nothing can be injected; for it is a ſign of a palſy of the rectum. When the pulſe is weak, the extreme parts cold, and the inward burn, or are without ſenſe, nothing good can be expected. When ſwallowing is attended with a murmuring noiſe, it ſhews the approach of a delirium, an inflammation of the fauces, aphthæ, or a palſy of the whole œſophagus. It is neceſſary to know, that this diſeaſe ſometimes quickly terminates, eſpecially if there be a malignant fever, and then it kills in ſeven, nine, or fourteen days; ſometimes it does not ceaſe till the fortieth or upwards; when it continues a long while, it either kills the patient, or brings on a dropſy, a lientery, the cœliac paſſion, a tabes or hectic, which are incurable.

The common method of curing a dyſentery, is firſt to bleed, then to vomit with ipecacuanha, afterwards to purge with rhubarb, and laſt of all to give aſtringents. Hoffman directs a ſcruple or half a dram of the ipecacuanha, with a teſtaceous powder, drinking a large quantity of warm water after it. This vomit is ſometimes to be repeated. It is the modern practice, after the firſt vomit, to give two or three grains of ipecacuanha every eight or ten hours, in a bolus, with diaſcordium, or the like, with ſome proper julep. Hoffman would have the rhubarb given in ſubſtance, that is, half a dram in powder; Dener gives it twelve hours after the vomit, repeating it in ſmall doſes.

Mr Ray ſays, that the fungous ſubſtance between the lobes of a walnut, dried and powdered, and given in a moderate quantity in wine, cured the Engliſh army of a terrible dyſentery in Ireland, when all other remedies failed.

Juſſieu ſays, a thick yellow bark, called ſimaruba, has been found ſucceſsful in the cure of a dyſentery. The doſe is a third part of a quart of a decoction made with two drams of the bark. And Cramer aſſures us, we may depend upon the ſame effect from the decoction of common millet-ſeed, called St Ambroſe's ſyrup, which Luther looked upon as a cure for the colic. Count Argenton took it firſt by his advice, merely to quench his thirſt, in the manner of tea, by which means he got rid of his thirſt and dyſentery in twelve hours time.

Another ſpecific is the vitrium antimonii ceratum, which has been in uſe for ſome time, but was kept a ſecret till it was communicated by Dr Young of Edinburgh to the public.

The manner of preparing it is as follows:

Take of glaſs of antimony in powder, one ounce; beeswax, one dram: melt the wax in an iron ladle, then add the powder: ſet them on a ſlow fire without flame, for the ſpace of half an hour, continually ſtirring them with a ſpatula; then take it from the fire; pour it upon a piece of clean white paper, powder it, and keep it for uſe.

The ordinary doſe for an adult is ten or twelve grains; but for greater ſafety begin with ſix.

Never give opiates in the beginning, eſpecially where there is great ſickneſs; becauſe, though opiates give relief to ſome, yet at other times both the ſickneſs and purging increaſe the following day.

Bontius, in his account of the diſeaſes of the Eaſt-Indies, affirms, that extract of ſaffron is a ſpecific in the dyſentery of thoſe parts, even though it ſhould proceed from poiſon.

Of the Head-Ach.

The head-ach is a moſt troubleſome ſenſation in the nervous membranes of the head, produced by various cauſes, and attended with different ſymptoms, according to its different degrees, and the place where it is ſeated.

The moſt common ſeat of this diſeaſe is the pericranium; a membrane which inveſts the ſkull, coheres with the muſcles next the ſkull, and is joined to the dura mater by ſome fibres which paſs through the ſutures. It is a thin nervous membrane of exquiſite ſenſe. It may likewiſe be in the ſkin that covers the ſkull, and in the dura matter. This laſt but ſeldom happens; but when it does, it is very dangerous. There may likewiſe be a very acute pain in the thin membrane which covers the ſinus of the os frontis.

If the head-ach be ſlight, and affects a particular part of the head, it is called cephalalgia; if the whole, cephalæa; if one ſide only, hemicrania; if there is a fixed pain on the forehead, which may be covered with the end of the thumb, it is called clavus hyſtericus.

The general cauſe of the head-ach is a hindrance of the free circulation of the blood through the veſſels of the head.

When

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When the blood ruſhes with impetuoſity, and in too great plenty into the membranes, which may happen to the plethoric, to thoſe whoſe uſual bleeding at the noſe is ſuppreſſed, and to young perſons, there is a pain in the whole head, which becomes hot, ſwells, aches, and looks red; the veſſels ſwell, and there is a ſtrong pulſation in thoſe of the neck and temples. The noſtrils are dry and parched, there is a burning heat and drought in the fauces.

When the veſſels of the head are ſtuffed with a mucous ſerum from a ſtoppage of the running of the noſe, then there is a heavy, obtuſe, preſſing pain, chiefly in the fore-part of the head, in which there ſeems to be ſuch a weight, that the patient can ſcarce hold it up. Sometimes the ſkin is ſo ſwelled, that it will pit.

Sometimes it happens from the ſerous, ſharp, cauſtic matter of the French diſeaſe, which infects the pericranium, and often cauſes a caries in the ſkull.

Sometimes it may proceed from matter of a ſaline cauſtic nature, driven back from the external parts; as, in the gout, itch, eryſipelas of the head, gutta roſacea; in the ſmall-pox and meaſles, before the morbid matter is expelled to the outward ſkin, or, which is worſe, when it is driven back. In theſe caſes, when a ſmall quantity of cauſtic matter cauſes the pain, it rather proceeds from a violent ſtricture of the membranes than from their diſtenſion.

There is likewiſe a moſt violent, fixed, conſtant, and almoſt intolerable head-ach, which brings on a debility both of body and mind, hinders ſleep, diſturbs digeſtion, deſtroys the appetite, cauſes a vertigo, dimneſs of ſight, blindneſs, a noiſe in the ears, convulſions, and the epilepſy; and, by conſent of the other nervous parts of the body, produces vomiting, coſtiveneſs, coldneſs of the extreme parts, and the countenance of a dying perſon.

Sometimes the head-ach is ſymptomatic, and attends upon continual and intermitting fevers, and eſpecially the quartan, irregular flowing of the menſes, the hypochondriac paſſion, and the like. A hemicrania generally proceeds from a fault in the ſtomach, from crudities or indigeſtion, and commonly appears when digeſtion is performed.

The head-ach is not always without danger: If the cauſe of the pain is within the ſkull, and is violent and conſtant, attended with a fever and want of ſleep, it portends a phrenſy. If it ſuddenly attacks the hypochondriac, or thoſe that are prone to melancholy, eſpecially if preceded by a violent paſſion of the mind, and deprives the patient of ſleep and appetite, and is joined to difficulty of hearing, and an internal pulſation of the veſſels, and all theſe without a fever, it preſages madneſs. But when the pain in the head is ſudden and very acute, with a noiſe in the ears, difficult walking, a weakneſs of the knees, an impediment and ſlowneſs in ſpeech, it is the forerunner of an apoplexy or a palſy; in which laſt the pain is greater on the well ſide than the diſeaſed, becauſe the latter has loſt all ſenſation.

The curative indications are, 1. To divert the impetus of the blood and humours from the head, and to diſcuſs them by ſuitable remedies. 2. To relax the ſpaſtic ſtrictures of the membranes of the head, the cauſe of which is a ſharp cauſtic matter, that the fluids may have a freer circulation. 3. To correct the peccant matter, and evacuate it gently through the moſt convenient emunctories. 4. To prevent a return by ſtrengthening the whole nervous ſyſtem by proper remedies, and eſpecially by an accurate diet and a ſuitable regimen.

When the blood ruſhes to the head in too great quantity, bleeding is neceſſary, more particularly under the tongue, in the forehead, in the jugulars, or by leeches behind the ears. If the body abounds with too much blood, it will be beſt to bleed in the ancle firſt, and the next day, or the day after, in a vein about the head. But firſt of all cleanſe the body by any emollient clyſter, or by giving an infuſion of rhubarb and manna, with cream of tartar.

To reſtrain the orgaſm of the blood, it will be proper to give a diaphoretic and abſorbent mixture, with diaphoretic antimony, purified nitre, burnt hartſhorn, and diacodium, diluted with a ſufficient quantity of ſuitable ſimple diſtilled waters.

When there is an intenſe pain remaining fixed in one place, lying pretty deep in the membranes, the herb ranunculus, uſed as a veſicatory, has a wonderful efficacy. It is the upright meadow-crawfoot, with leaves like the anemone, and, if taſted, is extremely biting to the tongue. The leaves muſt be bruiſed in a marble mortar, and the part, if hairy, ſhaved; then a ſticking plaiſter is to be laid on it, with a hole about the bigneſs of a ſilver penny, and the leaves over that; juſt in the ſame manner as a cauſtic. This is an experiment of Cheſnau's; and like ſucceſs may be had by mixing equal parts of volatile ſal ammoniac and powder of muſtard-ſeed, laying it on the part in the ſame manner.

When it is cauſed by a ſuppreſſion of a coryza or running of the noſe, a ſmelling-bottle of volatile ſalts ſhould be held frequently thereto. Or the patient may take herb-ſnuff, with the addition made of flowers of benjamin and powder of cloves.

When the head-ach ariſes from a corrupted maſs of blood and an impure ſerum, as in the ſcurvy and lues venerea; a decoction of the woods with crude antimony may be ſerviceable, after evacuations, faſting a day now and then, with labour and exerciſe, will likewiſe be uſeful; as alſo a ſudorific.

A hemicrania, eſpecially a periodical one, is generally owing to a foulneſs in the ſtomach and *primæ viæ*; for which gentle emetics will be beneficial, as alſo purgatives to derive the humours from the head; afterwards ſtomachics. If it proceeds from profuſe evacuations of the menſes or hæmorrhoids, thoſe fluxes muſt be reduced within bounds.

If the head ach is ſo intolerable as to endanger the patient's life, or is attended with continual watching, fainting fits, a fever, an inflammation, or a delirium, recourſe muſt be immediately had to opiates with native cinnabar, after a clyſter has been firſt given.

When there is an intolerable pain in the ſinuſes of the noſe, or the bony ſinuſes of the head, produced by an extravaſation of ſome fluid, the only cure is ſcarification of the noſtrils, or cauſing the noſe to bleed with a ſtraw ſuddenly thruſt therein.

If

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If there is an extravaſation under the pericranium, and the humour is ſo ſharp as to begin to render the bone carious, then recourſe muſt be had to an inciſion, as in a whitloe.

In ſome kinds of head-ach, it will be proper to open the frontal vein.

When the patient's ſtrength will not bear the loſs of blood, temperate pediluvia will be beneficial, and ſtrong frictions of the feet with a coarſe cloath; as alſo cataplaſms of horſe-radiſh and ſalt laid thereto.

Of the Heart-Burn.

The heart-burn is a pain more or leſs violent about the pit of the ſtomach, with anxiety, a nauſea, and often a reaching, or actual vomiting.

The cauſes are, vitiated humours in the ſtomach, vellicating and gnawing the ſtomach itſelf, or its left orifice, which the ancients call cardia. The ſtomach thus irritated, a painful ſenſation is excited, and ſpaſmodic conſtrictions, which occaſion a nauſea and vomiting. But common heart-burns are generally without vomiting. The heart-burn may alſo proceed from wind and indigeſtion, and now and then from worms; but more frequently from congeſtions of blood about the ſtomach, which may happen to thoſe who are full of blood, but more eſpecially to the hypochondriac and hyſteric, when vomiting of blood not ſeldom enſues.

The cure of a common heart-burn from indigeſtion and the acrimony of the contents of the ſtomach, which chiefly happens in a morning with wind, may be performed only by drinking tea or coffee, or a decoction of camomile flowers; as alſo by taking bitters, or a dram of powder of orange peel, or camomile flowers, in a ſmall glaſs of wine made pretty hot, and ſweetened with ſugar. The teſtaceous and abſorbent powders are excellent in this caſe; ſuch as the tabellæ cardialgiæ, or lozenges for the heart-burn, which may be carried in the pocket and taken at pleaſure; about a dram is ſufficient for a doſe.

When it ariſes from a crapula, gentle emetics will be uſeful. If the patient begins to vomit without them, large draughts of warm water will aſſiſt to cleanſe the ſtomach; or carduus benedictus tea taken freely.

If the cardialgia proceeds from a congeſtion of blood, and the painful ſpaſms then ariſing, bleeding will be convenient, and emetics hurtful. If the menſes are ſtopped, bleed in the foot.

Nor muſt anodyne and emollient clyſters be omitted. It will likewiſe be proper to apply a bladder filled with a decoction of chamomile, pretty hot, to the ſtomach. After recovery, riding will be convenient to regain the loſt ſtrength.

If worms are the cauſe of the heart-burn, no acrid anthelmintics muſt be given, but warm milk mixed with oil of ſweet almonds, which, if drank in ſufficient quantity, may cauſe them to be thrown up.

Of the Tooth-Ach.

The tooth-ach is cauſed by impure ſerum, which corrodes and rends the ligaments and nerveo-glandulous coats, by which the roots of the teeth are kept firm in their ſockets, and wherewith they are inveſted.

It is a kind of rheumatic diſorder; for we have often obſerved that pains of the joints and ſhoulders have ſhifted to the ſide of the head, and have invaded the teeth and gums with violent pain. On the contrary, pains of the head and teeth have fallen into the arms and ſhoulders.

The ſeat of the tooth-ach may alſo be in the cavity or internal parts of the teeth themſelves, that is, in the little veſicular cord compoſed of the nervous membrane, an artery, a vein, and a lymphatic veſſel, which may either be diſtended by ſtagnating ſerum, or be affected with a ſpaſtic conſtriction, eſpecially if the tooth is carious, and the caries reaches the ſaid cord.

As in the gout there is a pain, redneſs, a tumour, and a little fever, ſo they ſometimes appear with the tooth-ach. There is alſo frequently a copious diſcharge of ſaliva, which proceeds from a painful ſpaſm, which conſtringes the lymphatic and venous veſſels.

As the rheumatiſm appears in temperate, and a ſudden change of weather; ſo it is with the tooth-ach, eſpecially when the weather is hot and cold by fits.

The whole intention of cure conſiſts in deriving and diverting the impure ſcorbutic ſerum from the head, and then carrying it off through proper emunctories; and afwards in ſtrengthening the parts.

This is to be done by ſaline, emollient, purgative clyſters; by warm pediluvia of rain-water and wheat bran, with venice ſoap, and uſed juſt before bed-time; by laxatives of manna and caſſia diſſolved in whey or aſſes-milk or mineral waters. If the patient is plethoric or full of blood, bleeding in the foot will derive the humours from the head.

Sudorific remedies are alſo proper, but more eſpecially an electuary made of rob of elder-berries, burnt hart's-horn, diaphoretic antinomy, and a few grains of nitre, which cannot be too highly praiſed. Or an ounce of the rob may be taken in broth to promote a diaphoreſis; and it may be uſed externally, diſſolved in beer, in the manner of a gargle, which will yield immediate relief to the patient.

Outwardly may be applied bags, filled with paregoric and emollient ſpecies, ſuch as elder, melilot, and camomile flowers, bay and juniper-berries, carraway and millet ſeeds, and decrepitated ſalt. They muſt be laid on warm, and are very ſafe.

A drop or two of oil of cloves, or box, applied to a carious tooth with cotton, are medicines not to be deſpiſed. Camphorated ſpirit of wine mixed with ſaffron, caſtor, and opium, made into a liniment, and laid to the gums and hollow teeth, often gives the patient eaſe.

When the tooth-ach proceeds from a rotten, hollow tooth, it will be beſt to burn the little nervous cord, which is the ſeat of the pain, with an actual cautery; and then the cavity may be filled up with a mixture of wax and maſtich.

If this cannot, or is not permitted to be done, the only remedy left is to have the tooth drawn. But if the patient is plethoric, it will be ſafeſt to bleed firſt, for fear of a fatal hæmorrhage.

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A ſmall pill, made of equal quantities of camphor and opium, and put into a hollow tooth, is often beneficial. Some greatly recommend a ſmall plaſter of tacamahac laid on the ſide of the face, upon the articulation of the jaw-bone, or upon the temples.

But above all, the root of iris lutæa, or the yellow water flower-de luce, rubbed upon the tooth that is painful, or the root itſelf chewed in the mouth, in an inſtant, as if by a charm, drives away the pains of the teeth, ariſing from what cauſe ſoever.

It is now become a practice, eſpecially in France, upon drawing a ſound tooth, to replace it in its ſocket: where, with proper precautions, it will faſten again. Muſgrave is the firſt who recommends this practice. After the extraction of the tooth, he adviſes a gargle of honey, mixed with the juice of the herb mercury, common ſalt, and ſpring-water, and then to put it in its former place; and adds, it will become more uſeful than before

The French operators have improved this hint; and when the tooth is rotten, or otherwiſe unfit to be replaced, they put another ſound human tooth in the room of it, when it can be had; otherwiſe one of any other animal that is of a ſize ſuitable for the purpoſe.

De la Motte, in the tooth-ach, adviſes to make a ſmall round ſticking plaiſter, about the bigneſs of a ſilver groat, and to put a flat bit of opium in the middle of it, of a ſize not to prevent the adheſion of the other. This is to be laid on the artery near the cavity of the ear, where the pulſation is moſt ſenſible. He affirms, there are few caſes that this will not relieve.

Of the Ear-Ach.

The ear-ach is a grievous pain in the meatus auditorius, or cavity of the ears, proceeding from a ſharp extravaſated ſerum affecting the nervous membrane which lines the meatus auditorius.

This diſorder frequently attacks thoſe who are ſubject to rheumatic and ſerous defluxions; or it may ariſe from a ſudden ſuppreſſion of ſweat, or from the head being expoſed to cold winds when it is moiſt with ſweating. The cauſe is often an inflammation or ulcer of the ear, attended with a remarkable heat, and tenſive beating pain, a redneſs, a fever, and even ſometimes a delirium. Sometimes it is excited by worms; and then there is a wandering, cutting, gnawing pain.

The ear-ach is ſometimes ſo violent as to cauſe a delirium, with the higheſt inquietude and anxiety, inſomuch that the patients often fall into an epilepſy through the violence of the pain.

The ear-ach is ſometimes a ſymptom of acute fevers, when the morbific matter is tranſlated to the ear, as in the Hungaric diſeaſe, when deafneſs or difficulty of hearing ariſes. When it happens in the declenſion of a fever, it is a certain ſign of recovery; but then the diſorder is in the internal part of the ear, and the auditory nerve. When the matter is tranſlated to the external part, then the ear-ach ariſes; which, unleſs ſpeedily appeaſed, may deprive the patient of life. Thoſe who have the ear-ach from a fall, and a ſanious matter runs out of the ear, are all carried off.

The principal ſcope is to eaſe the pain, which may be done with nitrous and cinnabarine powders, and with emulſions of the greater cold ſeeds; but if theſe are ineffectual, we muſt have recourſe to opiates, ſuch as the ſtorax pills, or the thebaic tincture.

Outwardly, lay a plaſter to the temple of the affected ſide, compoſed of maſtich, galbanum, ſaffron, expreſſed oil of nutmegs, and opium. Afterwards let the ear be held over the vapour of milk, with the fragrant and emollient ſpices. Alſo, fill a hog's bladder with the decoction of milk of flowers of mallows, mullein, elder, mellilot, camomile, linſeed, and a little ſaffron, and apply it to the part affected. Likewiſe the ſmoke of tobacco blown into the ear, and an infuſion of millepedes in ſalad oil, are thought be of great efficacy when the inflammation is cauſed by a ſharp ſerum.

Camphorated ſpirit of wine, eſpecially with ſaffron, made pretty hot, and a few drops of it put into the ear with cotton-wool, is a great reſolvent; it ſhould alſo be rubbed into the parts behind the ear. Or oil of almonds with camphor may be uſed in the ſame manner; laying over either of them a hot bag filled with reſolvent herbs, as ſage, penny-royal, wild thyme, wild marjoram, camomile flowers, Florentine orris, fennel and caraway ſeeds, with camphor. When the patient is plethoric, bleeding is convenient.

The moſt violent ear-ach, from taking cold, may be infallibly cured, in a very ſhort time, by applying the ear cloſe to the mouth of a bellied jug, filled with a hot ſtrong decoction of camomile-flowers.

When the inflammation will not reſolve, a poultice of white bread and milk, or onions roaſted under the cinders, or the like, may be often laid hot to the part affected, till it breaks, or the abſceſs is evident to the eye.

If the ear-ach is cauſed by any thing got into the ear, it will be beſt to relax the membrances by oil of almonds, and then cauſe the patient to ſneeze, which forces it out.

When there is a copious flux from the ear after an abſceſs, the humours muſt be diverted by gentle laxatives, bliſters, cupping, and pediluvia, if the patient is an adult. It ſhould not be ſuddenly ſtopped by externals.

Of the Stone *in the* Gall-Bladder.

The ſigns of it are a fixed pain in the right hypochondrium in the region of the liver, which is conſtant, preſſing, heavy, and ſometimes acute; often attended with an ill colour in the face. The pain ſometimes reaches to the epigaſtric region and the pit of the ſtomach. And the exacerbation is ſo great, at certain intervals, that the gripes and torture affect the whole cavity of the abdomen; joined with inappetence, a naufea, reaching to vomit, anxiety of the præcordia, cardialgic anguiſh, coſtiveneſs. At length, if the diſeaſe is obſtinate, and will not yield to the beſt remedies, the jaundice ſupervenes. Some of theſe patients are continually afflicted with gripes, and live in this condition for many years, and generally die of the dropſy. Some feel a heavy, obtuſe, deep, obſtinate pain, with a tenſe weight, when the gall-bladder is greatly diſtended with ſmall ſoft ſtones.

If the pain continues very intenſe and ſharp, it draws the whole ſyſtem of the nervous parts into conſent, cauſing ſpaſtic ſtrictures, not only of the adjacent parts, but alſo

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of the remote; diſtentions of the arms and joints, epileptic convulſions, and likewiſe a fever with a hard quick pulſe, which ſhews a large rough ſtone is firmly fixed in the biliary ducts, that will ſoon hurry the patient out of the world.

But nothing is a more certain ſign that theſe terrible diſorders proceed from gall-ſtones, than when they are voided with the excrements; and then all the ſymptoms ceaſe at once, except the jaundice, which diſappears by little and little, or is eaſily cured.

If the ſtones are ſoft, and of a light colour; or tophaceous and like mortar of plaſter, they moſt probably proceed from the hepatic ducts: If they are rough, hard, angular, and of a deep colour, they proceed from the gall-bladder, eſpecially if attended with moſt cruel ſymptoms in their paſſage through that ſlender canal. However, ſtones have been found in the gall-bladder after death, which have produced no extraordinary ſymptoms.

There are two times of the diſeaſe, which require two different methods of treatment; in the fit, and out of the fit.

In the fit, the ſpaſms are to be appeaſed with anodynes and demulcents, ſuch as oil of ſweet almonds, and freſh ſperma ceti, internally; externally, the fat of a wild cat, or a beaver, *&c.*

Demulcents are, milk, ſweet whey, emulſions of the cold ſeeds, infuſions or decoctions of marſhmallow roots, with wild poppies, elder, ſyrup of marſhmallows.

Powders may be made with crabs-eyes, cinnabar, and nitre, with a little ſaffron, powder of earth-worms, elks-hoofs, *&c.*

Externally, emollient epithems, and facculi, filled with carminative ingredients. As alſo lenient clyſters and laxatives of manna, rhubarb, cream of tartar, and the like.

Out of the fits, opening infuſions and decoctions; which reſolve, diſcuſs, and promote excretions; ſuch as tincture of rhubarb, dog-graſs, aſparagus, parſley, pimpinel, afterwards adding rhubarb, terra foliata, tartar, or ſal. polychreſt. and ſyrup of marſhmallows, which muſt be uſed a long while.

Some praiſe the roots of dog-graſs, and the juice of dog-graſs, as a ſpecific.

Some uſe the powder of millepedes with neutral Salts.

Epithems made of camomile-flowers, leaves of ſcordium, wormwood, and carduus benedictus, elder-flowers, water and red wine, uſed often in a day, are beneficial.

But if theſe fail, after long uſe, the only refuge is in mineral waters, among which the Pyrmont is not the leaſt ineffectual.

Theſe are alſo properly uſed by way of prevention, with exerciſe, and decoctions of the aperient roots.

Of the GRAVEL *and* STONE.

A NEPHRITIC paroxyſm is attended with a fixed pain in the region of the loins, bloody urine, voiding of gravel or ſmall ſtones, a numbneſs of the thigh on the ſide of the part affected, a drawing up of the teſticle on the ſame ſide, a nauſea and vomiting. After the ſtone is fallen into the bladder, the urine preſently becomes very thick, turbid, blackiſh, and in great quantity.

When the ſtone or gravel begins to move and make its way into the ureters, then the pain begins, which is more or leſs ſharp according to the ſize and figure of the ſtone. It is ſometimes ſo violent, that, beſides a coldneſs of the extreme parts, there is a nauſea, vomiting, and a ſpaſtic conſtriction of the precordia, a difficulty of making water, a conſtipation of the belly, a ſtraitneſs of breath, a ſtupor of the thigh, a retraction of the teſticle to the *os pubis*, inquietude, loſe of ſtrength, a ſyncope, convulſion-fits, or a fatal ſtoppage of urine.

When the violent pain has continued for ſeveral days and nights without intermiſſion, and has brought the patient exceeding low, attended with an entire ſuppreſſion of urine, with a coldneſs of the extreme parts and convulſions of the tendons, it is a ſign that death is at hand.

Nor is it a good ſign when the ſtone has continued a a long while in the ureter for then the appetite decays, and a nauſea and reaching to vomit ſupervene, till the patient is conſumed with a hectic heat, and the approach of death is haſtened. Sometimes the pain is attended with an inflammation of the ſtomach or inteſtines. Some, from a ſtoppage of urine, fall into a dropſy of the breaſt, a lethargy, or convulſions.

The whole intention of cure conſiſts in the eaſy excluſion of the ſtone, and the preventing the breeding of others. HOFFMAN.

If the patient is of a ſanguineous temperament, take away ten ounces of blood on the affected ſide; and then let him drink, as ſoon as poſſible, a gallon of poſſet-drink, in which two ounces of marſhmallow roots have been boiled. Then gave an emollient clyſter.

When the poſſet-drink has been vomited up, and the clyſter returned back, give a pretty large doſe of an opiate; that is about 25 drops of the thebaic tincture, or 15 grains of the pil. ſaponaceæ.

Alſo let a bath or ſemicupium be prepared, of a decoction of althea roots, linſeed, fœnugreek ſeeds, and chamomile flowers; to theſe may be added, a few white poppy heads.

In the nephritic diſorder, the grand point is the evacuation of the ſabulary matter lodged in the pelvis of the kidneys, or in the ureters. Bleeding ſerves to remove the tenſion and inflammation; and emollient clyſters are of a double ſervice, becauſe, by fomenting the ſlender tubes, they relax the contraction, and, by unloading the lower bowels, they remove the preſſure againſt the ureters. The worm bath opens the paſſage yet more, greatly relaxing the abdominal muſcles, peritonæum, and inteſtines; the bladder is alſo relaxed by it, and conſequently the oblique inſinuation of the ureters through its ſeveral membrances is leſs liable to obſtruct the evacuation of this ſandy matter into its cavity.

By moderate diuretics, and emollient medicines, this diſcharge is aſſiſted; while anodynes ſuſpend the pain, and procure a paralytic reſolution or a ſpaſmodic contraction of the ureters, and thereby contribute not a little to open the paſſage.

Theſe appear to be the moſt conſiderable methods for the relief of this diſorder, which is but imperfectly managed without the united aſſiſtance of all, and which, uſed together, ſeem the utmoſt that art can furniſh.

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A turpentine clyſter is generally accounted very ſerviceable in a fit of the gravel.

Heiſter recommends the ſolution per deliquium of the ſal diureticus, or the terra foliata tartari, mixed with a fifth part of the thebaic tincture, of which 50 or 60 drops may be given now and then, which will eaſe the pain, and gently expel the ſtone or gravel.

When the ſtone is too big to paſs, the diet ought to be cool and diluent, to hinder the growth as far as poſſible. The diuretics that gently reſolve, are parſley, fennel, ſcorzonera, mallows, and tea; dandelion, ſuccory, oats, barley, honey, honey and vinegar; nitrous ſalts, as dulcified ſpirit of nitre: The moſt ſoft cooling diluter is whey; the beſt emollients are a decoction of marſhmallows and linſeed tea.

When a ſmall ſtone paſſes through the ureters into the bladder, it is generally expelled; but if it happens to ſtay in the bladder, it increaſes by the appoſition of freſh matter, or in an orbicular manner, while the original ſtone remains like a real kernel. Theſe additional coats are either red, white, aſh-coloured, or bluiſh.

The ſtone in the bladder may cauſe an inflammation, with its ſymptoms; as alſo preſſures, attritions, ulcers, purulent urine, ſtranguries, obſtructions of the urethra, an inability to diſcharge the urine, unleſs in a ſupine poſture; a hectic fever, and a conſumption. Sometimes the ſtone gets into the urethra, and plugs up the paſſage.

A ſtone in the kidneys may be known from a dull obtuſe pain therein; from bloody urine after walking in a rough way, or after violent motion of the body, eſpecially by being ſhook in a coach or other wheel'd carriage; from having voided ſtones formerly; and from the urine's being mixed with caruncles, pus, and filaments.

A ſtone of the bladder is known from a pain at the time of, as well as before and after making water; from the urine coming away by drops, or ſtopping ſuddenly when in a full ſtream; by a violent pain in the neck of the bladder upon motion, eſpecially on horſeback, or in a coach over the ſtones; from a white, thick, copious, ſtinking, mucous ſediment; from an itching in the head of the penis; from a teneſmus while the urine is diſcharged; by ſearching, with introducing the finger in the anus, or with a catheter; as alſo from the effects produced by the ſtone before mentioned.

As to the cure of the ſtone in the bladder, the medicines of Mrs Stephens were lately much in vogue as a diſſolvent; and Dr. Hartley, by leaving out the ſuperfluous part of them, has reduced them to the following form.

1. Take 2 or 2½ ſcruples of calcined egg-ſhells, thrice a day, in any convenient liquid, drinking after each doſe a third part of the following decoction:
2. Take 2 or 2½ ounces of Spaniſh ſoap, and diſſolve it in a ſufficient quantity of boiling water; filter, and ſweeten with honey or white ſugar.

The powder may be taken in three or four ſpoonfuls of any liquor that is not acid: If the largeſt quantity of the decoction is taken, it will be beſt to divide it into four doſes.

The egg-ſhells muſt be calcined in a crucible eight or ten hours, to bring it to a lime; and then be expoſed to a dry air, for ſix weeks or two months, that is, till they ſlacken or fall off into an impalpable powder, which muſt be ſifted and put into bottles well corked.

The taking of theſe medicines muſt be continued for ſome time after the complaint ceaſes, leſt any part of the ſtone ſhould remain, which would be then rugged and unequal, and occaſion exquiſite pain afterwards.

It is common, after a few days uſe of theſe medicines, to have a great increaſe of pain in making water; at which time, opiates, emollients, warm baths, fomentations, a ſoft diet, and reſt, are proper.

Dr Hales, after ſeveral trials of the different ingredients of Stephen's medicines, found that the diſſolving power of them lay in the lime. And Dr Jurin, having taken ſoap-lees, the ingredients of which are potaſhes and lime, beginning with a few drops, and increaſing the quantity, till he took an ounce, or an ounce and a half, every day in a proper vehicle, was cured of bloody urine, pain, *&c.* and paſſed ſeveral ſtones; after which he had no uneaſineſs. Hartley thinks the capital ſoap-lees are beſt taken in milk, half an ounce of which requires half a pint of milk. He thinks an ounce and a half, or two ounces, may be taken thus every day with perfect ſafety.

But Hales rightly conjectured, that lime-water alone was likely to have a good effect in diſſolving the ſtone; which put Dr Whytt upon making experiments therewith, which have happily ſucceeded; whence he propoſes the following method of cure.

Let the patient ſwallow, in any form, an ounce of Alicant ſoap every day, and drink three pints or more of oyſter or cockle ſhell lime-water. If the ſoap be taken in pills, it may be divided into three doſes: the largeſt may be taken early in the morning faſting, the ſecond at eleven before noon, and the third at five in the afternoon, drinking after each doſe a large draught of lime-water, the remainder of which may be drank at meals, inſtead of the uſual liquors.

The diſagreeable taſte of the lime-water may be mitigated by adding a very ſmall quantity of new milk to it; and is quite deſtroyed by waſhing the mouth immediately with a little vinegar and water, and carefully ſpitting it out again. A dram and a half or two drams of juniper-berries, infuſed in every quart bottle, will mend its taſte much. But if the patient diſlikes pills, let him diſſolve an ounce of ſoap in a pint and a half of warm lime water made of ſhells, which have been long expoſed to the weather; and take this at three different times, drinking the reſt of the lime-water by itſelf.

If the ſhell lime water cannot be had, let him take the ſame quantity of ſtone lime-water, with at leaſt an ounce and a half of ſoap, becauſe it increaſes its diſſolving power.

If there is an invincible averſion to ſoap, there is reaſon to think, from experiments that have been made, that oyſter-ſhell lime-water alone, taken in larger quantities, will have greater effects in diſſolving the ſtone, than ſtone lime-water even when aſſiſted by ſoap.

At firſt the patient ſhould begin with ſmaller quantities of lime-water than that mentioned above, which he may increaſe by degrees, and ought to perſevere in the uſe of it, eſpecially if he finds any abatement of his complaints or ſymptoms of the ſtone's diſſolving, for ſeveral months, or, if the ſtone be large, years; during which he ſhould abſtain from acid or fermented liquors.

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For his drink, he may uſe milk and water, or a potion made with roots of marſhmallows, parſley, and liquorice. But if he has been accuſtomed to more generous liquors, he may drink ſmall punch made without acids. Spirits muſt not be drank at all, nor the weak punch but very ſparingly. It will be alſo proper to forbear the uſe of ſalt meats, honey, and acid fruits, or at moſt to uſe them ſparingly. Artichoaks, aſparagus, ſpinnage, lettuce, ſuccory, parſley, purſlane, turnips, carrots, potatoes, radiſhes, green-peaſe, may be ſafely uſed; but onions, leeks, and celery, ſhould be preferred to moſt other vegetables.

The patient ought to drink no more of any liquor than is ſufficient to quench his thirſt; and he ſhould retain his urine as long as he can without uneaſineſs, that it may have the greater time to act on the ſtone.

If the lime water occaſions coſtiveneſs, it will be neceſſary now and then to take a purgative; the moſt proper are aloes, manna, rhubarb, ſenna, or jalap.

Such as have a ſtone in the bladder, ſhould, while they are taking the medicines, have four ounces or upwards of tepid ſhell lime-water injected into the bladder every day, and retain it as long as they can without pain, and ſhould evacuate their urine immediately before injection.

Were it not for the trouble of introducing the catheter, an injection might be made at leaſt twice a-day; and if a flexible catheter were always kept in the bladder, it might be done at pleaſure, and the diſſolution of the largeſt ſtone quickly procured.

That the injection of the bladder may be more ſafe, and attended with leſs uneaſineſs, a dram of ſtarch may be boiled in ſix or ſeven ounces of lime-water, and juſt be brought to boil over the fire. The fourth part of the yolk of an egg, being mixt with ſix ounces of lime-water, does not weaken its virtues any more than the ſtarch, and may be occaſionally uſed in its ſtead.

Such as have no ſtone in the bladder, but are frequently troubled with fits of the gravel in the kidneys, may probably prevent them, by drinking every morning a pint of ſhell lime-water, two or three hours before breakfaſt; and though it may be too ſmall a quantity to diſſolve the ſtone, yet it may prevent any new concretions.

Of the RHEUMATISM.

THE rheumatiſm chiefly attacks perſons in the flower of their age, after violent exerciſe, or a great heat of the body from any other cauſe, and then being too ſuddenly cooled: but ſpares neither men nor women, old nor young, eſpecially if the perſon is full of blood depraved with any kind of acrimony. The diſeaſe is nearly akin to the gout.

It begins with chilneſs and ſhivering, followed by inquietude and thirſt. Which is preceded with ſpontaneous laſſitude, a heavineſs of the joints, and coldneſs of the extreme parts When the fever appears, there is an inward heat, chiefly about the præcordia, attended with anxiety. The pulſe is quick and ſtrait, the appetite is loſt, and the body coſtive. In a day or two, ſometimes ſooner, the patient feels a racking pain, ſometimes in one joint, ſometimes in another, but more frequently in the wriſts, ſhoulders, and knees; frequently ſhifting from place to place, and leaving a redneſs and ſwelling in the part viſited laſt. The pain is exaſperated upon the leaſt motion; it ſometimes attacks the loins and coxendix.

When it ſeizes the loins, it is called the lumbago; and there is a moſt violent pain in the ſmall of the back, which ſometimes extends to the oſſa ilium, and is like a fit of the gravel, only the patient does not vomit. If this diſeaſe is unſkilfully treated, it may continue ſeveral months or years, but not always with the ſame violence, but by fits. If it continues and increaſes, it may cauſe a ſtiff joint, which will ſcarce yield to any remedy

Its proximate cauſe ſeems to be the inflammation of the lymphatic arteries, of the membranes near the ligaments of the joints, but not ſo violent as to bring on a ſuppuration. The blood is like that of perſons afflicted with the pleuriſy.

Take away ten ounces of blood on the ſide affected. This muſt be repeated three or four times, or oftener, once every other or every third day, according as the ſtrength of the patient will bear.

The diet muſt be very thin, and an emulſion of the four cold ſeeds may be preſcribed; and alſo a poultice of white bread and milk, tinged with a little ſaffron, may be laid on the parts affected.

If the patient cannot bear frequent bleeding, after the ſecond or third time, give the common purging potion every other day, and an ounce of diacodium at night, till the patient recovers.

If the rheumatiſm begins with a febrile efferveſcence, temperate diaphoretics, with nitrous things, in a moderate doſe, and often repeated, are beneficial; ſuch as crabs-eyes, burnt hartſhorn, amber, cinnabar, purified nitre, with diapnoic and gently anodyne waters, alſo citron-juice, or its ſyrup. The common drink ſhould be whey acidulated with citron-juice or cream of tartar; or decoctions of the ſhavings of harſhorn, roots of ſcorzonera, ſuccory, liquorice, or fennel-ſeeds.

To purge, it may be proper to chew or eat rhubarb, from two ſcruples to a dram, with raiſins or currants.

In an incipient rheumatiſm of the ſhoulders, nothing is better than a bliſter laid between the ſcapulæ.

But if the patient happens to be plethoric, nothing is better than a decoction of the ſudorific woods, to the quantity of a quart a-day, for a month or ſix weeks together.

This laſt is good in the venereal rheumatiſm, when aſſiſted with crude antimony and mercurius dulcis.

Young perſons who are temperate livers, and not addicted to ſtrong liquors, may be cured by a ſimple refrigerating diet, and moderately nouriſhing, as certainly as by repeated bleeding; for inſtance,

Let the patient live four days upon whey alone; and after that white bread may be allowed for dinner, and, on the laſt days of his illneſs, he may be allowed it for ſupper. When the ſymptoms ceaſe, he may be allowed boiled chickens, or other things of eaſy digeſtion; but every third day he muſt live upon whey only, till his ſtrength returns.

BOERHAAVE's method of cure is to the ſame effect, only he adviſes warm baths and ſtrong bliſters to be laid upon the part affected, nay, even cauteries themſelves.

ARBUTHNOT

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Arbuthnot ſays, cream of tartar in water-gruel, taken for ſeveral days, will abate the pains and ſwellings conſiderably, by its acidity correcting the alkaline ſalts of the blood.

Ridley uſed mercurius dulcis in rheumatic caſes, as a purge, with good ſucceſs, giving a ſcruple in conſerve of violets over night, and three pints of epſom waters, evaporated away to one half, in the morning.

Dr James has wrote a treatiſe to prove the efficacy of mercurial preparations, as well in the rheumatiſm as in the gout, which is ſupported with very good authorities.

And Huxham ſays, that the obſtinate rheumatic pains, which remained after the epidemical fever of 1737, would yield to mercurial cathartics; but he preferred to every elſe what he calls the eſſence of antimony, which is nothing elſe but emetic wine made with glaſs of antimony, with the addition of a little ſpicy ſtomachic. This, given to 20 or 30 drops, operates by gentle ſweats, and purges in a larger doſe very mildly.

Hoffman likewiſe recommends mercurials and antimonials in particular caſes; that is, when a violent and obſtinate pain afflicts the lower parts of the body, about the oſſa iſchii and the os coccigis, and the patient is of a robuſt conſtitution, then the more powerful chemical medicines may be made uſe of, ſuch as mercurius dulcis, the ſolar precipitate rightly prepared, or the medicinal regulus of antimony, to which a decoction of the ſudorific woods may be added. From ſuch medicines as theſe great relief may be expected.

Cheyne ſays the hot and inflammatory rheumatiſms have all the ſymptoms of the gout, and like it change from place to place, and by over violent evacuations may be tranſmitted upon the noble organs. And by the way it may not be amiſs to obſerve, that exceſſive bleeding, and other violent evacuations, conſtantly bring on a hectic or dropſy on the patient in this caſe; diſeaſes of a much more dangerous nature in themſelves, and far more difficult to be cured, than the original one. And therefore in this diſeaſe, only premiſing ſo much bleeding as will prevent a fever and mortification, and ſomewhat abate the pain (which gentle doſes of calomel and gum guaiacum will do more effectually, though not more ſpeedily, than bleeding itſelf) the reſt is to be done by large doſes of the bark and Æthiops mineral mixed; and a relapſe prevented by gentle doſes of gum guaiacum, with antimony diaphoretic, and cinnabar of antimony.

Pringle obſerves, that rheumatiſms are generally mild, though they ſometimes appeared with all the violence taken notice of by Sydenham. For which reaſon the firſt ſort were generally cured in two or three days by twice or thrice bleeding, and promoting a diaphoreſis by the cooler medicines, particularly by vinegar-whey. But if it was intended with an inflammatory ſwelling of the joints, ſweating was improper, and the cure was only to be obtained by repeated and almoſt daily bleedings. But then it is to be carefully remarked, that thoſe were afflicted with it who were beſt able to bear theſe evacuations; and in this diſeaſe he thinks frequent bleedings weaken the body leſs than in any other.

If the pain and ſwelling of the joints remain after this treatment, three or four leeches muſt be applied to the part where the inflammation and tumour are greateſt, and the blood is to ooze till it ſtops of itſelf. This may be repeated freely without danger. But unleſs there is both an inflammation and ſwelling, leeches will do no ſervice. The beſt internal medicines, in a true acute rheumatiſm, are neutral ſalts, with very ſmall doſes of camphor. The diet muſt be of the loweſt kind. All outward applications are to be omitted as long as any fever or inflammation remains.

The chronic rheumatiſm is either the remains of a rheumatic fever, or a continuation of pains that proceeded at firſt from leſſer but neglected colds. The blood in this caſe is ſizy. It is an obſtinate diſeaſe, but bleeding is the moſt efficacious remedy. Eight ounces of blood is to be taken away once in eight or ten days, as long as it is ſizy, or the complaints remain.

Bleeding has been repeated, in many caſes, three or four times, to no manner of purpoſe; nor would the pains abate without deobſtruents, diaphoretics, purges, and anodynes. Sometimes they have yielded to the cold bath alone.

Dr Clerk of Edinburgh declares the Arthritis Vaga, or flying gout, erroneouſly called the Scorbutic Rheumatism, may be often diſtinguiſhed by the urine of the patient; for certain filaments float in it not ſo tranſparent as the urine itſelf, but when taken out they appear as pellucid as cryſtal. They will rope to a great length, and when dried turn to a white calx. This he takes to be the morbific matter of the gout, gravel, goutiſh ſciatica, and all true arthritic pains, diſtinct from the rheumatiſm. Soap is the beſt diſſolvent of it yet known, half an ounce of which to an ounce may be taken in a day for a month together, if neceſſary, in the ſciatic and other arthritic pains.

Of the Gout.

The gout is a very painful diſeaſe, whoſe ſeat is in the joints and ligaments of the bones of the feet; the principal times of its invaſion are the ſpring and the autumn.

In treating of this diſeaſe, we ſhall firſt give an account of the regular gout, and afterwards of the irregular.

The regular gout uſually ſeizes the patient in the latter end of January or the beginning of February all of a ſudden, and without any previous notice, unleſs the patient has been troubled with crudities of the ſtomach and indigeſtion for ſome weeks before; the body likewiſe may have ſeemed to have been puffed up with wind, with a kind of heavineſs, which daily increaſes, till at length the fit comes on; a few days before which, there is a torpor, and as it were a deſcent of wind down the muſcles of the thigh, with a kind of ſpaſmodic affection of them. Likewiſe, the day before the fit, the appetite is more voracious, but not natural.

Though the patient ſeems to go to bed in good health, yet about two in the morning he is awakened by a pain which moſt commonly affects the great toe, ſometimes the heel, the ancle, or the calf of the legs, which pain reſembles that of diſlocated bones; there is likewiſe a ſenſation as if water almoſt cold was poured on the membranes of the part affected. Soon after, a ſhivering and ſhaking ſupervene, with a feveriſh diſorder. The pain which at firſt is tolerable, becomes more violent in proportion as

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the ſhaking decreaſes, and grows more intenſe every hour till night, and then it is at the height; ſettling itſelf about the little bones of the tarſus and metatarſus, whoſe ligaments it affects. Now there ſeems to be a violent extenſion of the ligaments, or there is a ſenſation of their being lacerated, or gnawed by a dog. Sometimes they ſeem to be preſſed or ſqueezed together. At this time the part affected becomes ſo exceeding ſenſible, that they cannot bear the weight of the ſheet, nor the ſhaking of the room by a perſon's walking about.

The patient is now in great torture, and is continually ſhifting his foot from place to place in hopes of eaſe. His body likewiſe is in as conſtant agitation as the part affected. This always happens at the acceſſion of the fit. But the pain continues without remiſſion till two or three in the morning, that is, twenty-four hours from the firſt onſet, at which time he begins to be at eaſe, which he is willing to attribute to the laſt poſture in which he placed the affected member. Now he falls into a gentle breathing ſweat, and gets a little ſleep, and, when he awakes, perceives the part to be ſwelled, and the pain much abated; for before, the veins of the member, being turgid, were only more conſpicuous than uſual.

The next day, or perhaps two or three days afterwards, if the gouty matter is copious, the part affected is a little in pain, which grows more violent towards the evening, and abates at the crowing of the cock.

In a few days the other foot begins to be affected in the ſame manner; and, if the pain has ceaſed in the firſt, the weakneſs which is left behind ſoon vaniſhes. The ſame tragedy is now acted over again. Sometimes, when the gouty matter is in great plenty, it attacks both feet at once, but it generally ſeizes one after the other.

After both the feet have been tormented, the fits which follow are out of rule, both as to the time of invaſion and the duration; only the pain grows more intenſe at night, and remits in the morning.

From a ſeries of theſe ſmall fits ariſes what is called a fit of the gout, which is longer or ſhorter, according to the patient's age. For it is not to be ſuppoſed that, when a patient has been laid up with the gout two or three months, that it is a ſingle fit, but rather a ſeries or chain of ſmall fits, which continually grow ſhorter and milder, till the peccant matter is at length conſumed, and the former health reſtored. This happens to the more vigorous, and whom the gout ſeldom viſits, in fourteen days; to perſons advanced in years, who have often felt its rage, in two months; but thoſe who are debilitated with age, or the long ſtay of the diſeaſe, it does not leave, till ſummer, being pretty far advanced, drives it away.

For the fourteen days the urine is higher-coloured, and depoſites a ſediment like gravel, and not above one third of what the patient drinks paſſes off by urine; the body on the firſt day is coſtive, the appetite decayed, there is a ſhivering towards the evening, as alſo a heavineſs and troubleſome ſenſation in the parts not affected. When the fit goes off, there is an intolerable itching in the affected foot, chiefly between the toes, from which and from the feet fall branny ſcales, as if the patient had ſwallowed poiſon.

The diſeaſe thus terminated, the patient's good habit of body and appetite return in proportion to the ſeverity of the pain in the laſt fit; and in the ſame proportion the next fit will be either accelerated or retarded; for, if the laſt fit was very ſevere, the next will not come on in leſs time than a ſolar revolution.

Hitherto you have an account of the regular gout, and its genuine phænomena; but when it is diſturbed by incongruous medicines, and the patient is worn out by the long continuance of the diſeaſe, it becomes irregular, and the ſubſtance of the body is as it were changed into a fomes of the diſeaſe, and nature becomes unequal to the taſk of conquering the malady thus changed, in the accuſtomed manner.

The feet were at firſt the ſeat of the diſeaſe, but now it attacks the hands, wriſts, elbows, knees, and other parts of the body. Sometimes it ſo diſtorts the fingers, as to make them reſemble a bunch of parſnips, and at length ſtony concretions appear about the ligaments of the joints, which, breaking through the ſkin, reſemble chalk, or crabs eyes. Sometimes the gouty matter invades the elbows, and creates a whitiſh ſwelling of the ſize of an egg, which ſoon aſſumes a red colour, and becomes inflamed. Sometimes it affects the thigh in ſuch a manner, as if a great weight was hanged thereon, and yet without any remarkable pain. From thence it deſcends to the knee, which it handles more roughly, hindering all motion, for the patient continues in the ſame place and poſture as if he were nailed to the bed.

Now the gout afflicts the patient all the year, except two or three months in ſummer; and the particular fit, which did not laſt above a day or two, continues ten or fourteen days; and the firſt or ſecond day after the onſet, he is diſturbed with ſickneſs as well as pain, and a total loſs of appetite.

His limbs alſo begin to be contracted and unapt for motion; and though he can ſtand, and perhaps creep about a little, yet ſo ſlowly, that you can ſcarce perceive he gets forward at all. If he ſtrives beyond his ſtrength, hoping by exerciſe to regain his legs, and to become leſs ſuſceptible of pain, the fomes of the diſeaſe will attack the viſcera in a more dangerous manner. The urine is like that of a perſon troubled with a diabetes, and there is a troubleſome itching in the back and other parts, eſpecially at bed-time.

Nature being at length oppreſſed with the diſeaſe and old age, the fits begin to grow more mild, and, inſtead of the uſual pain, there is a kind of ſickneſs, with a pain in the belly, a ſpontaneous wearineſs, and ſometimes a diſpoſition to fall into a diarrhœa; which ſymptoms vaniſh as often as the pain returns to the joints. And thus, the patient being alternately afflicted with pain and ſickneſs, the paroxyſm becomes very long and very tedious.

This diſeaſe ſeldom invades any patient till he is upwards of thirty, and men are more ſubject to it than women; as alſo perſons of acute parts, who follow their ſtudies too cloſely, eſpecially in the night, with an intenſe application of mind. Likewiſe thoſe who live high, and indulge their appetites, drinking plenty of rich generous wines; or who uſe acids too freely, or white eager wines; or who have been addicted too early to venereal pleaſures; or whoſe bodies are large, groſs, and full.

Thoſe

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Thoſe alſo are liable to it, whoſe ſweaty feet are too ſuddenly chilled; or who ſuffer their feet to ſweat in wet ſhoes and ſtockings. Hence hunting and riding in in the cold are pernicious. It may likewiſe be received by contagion, and is hereditary, deſcending from father to ſon.

The curative indications require, firſt, that the primæ viæ be ſet free from a load of indigeſted crudities, and the viſcera be reſtored to their priſtine vigour: that by theſe means the aliments may be duly concocted and aſſimilated into healthy fluids, and ſuch as will paſs freely through the ſmalleſt veſſels; while whatever is unfit for nouriſhment may paſs off by perſpiration, in due time and quantity. Secondly, that the fluid ſtagnation in, and ſtuffing up the ſmalleſt veſſels, may be expelled the body, and a free paſſage through the contracted veſſels be reſtored.

The firſt intention may be anſwered by vomits and gentle cathartics, repeated as occaſion requires; by bitters, aromatics, antiſcorbutic medicines; by alkaline fixed ſalts, taken in ſmall quantities for a long time; by aliments and drinks that are nouriſhing, light, eaſy of digeſtion, quickly aſſimilated and taken in due quantity; by powerful exerciſe often repeated and long continued, and eſpecially by riding in a dry, pure, ſerene air; by friction, by motion of the affected parts, by going to ſleep at early hours.

The ſecond intention may be anſwered partly by the preceding article, as well as by procuring gentle ſweats, by bathing in natural and artificial baths; by ſweating in a bagnio; or by the uſe of volatile ſalts, and copious drinking of attenuating liquors actually hot, in the morning while in bed, in order to procure a ſweat; as alſo by mercurial purges, taking a large quantity of diluents after them; by frictions of the whole body, eſpecially the parts affected, with hot, dry linen cloths, till a redneſs appear; by cold baths, and the like. Theſe things being uſed with prudence, and according to the various temperaments of the patient, will yield no ſmall relief, even in the nodous gout itſelf.

As the proximate cauſe lies in the vitiated ſtate of the ſmalleſt nervous veſſels of the body, and of the fluid that paſſes through them, it is no wonder that bleeding will not reach the matter, ſtate, or cauſe of the diſeaſe; yet it may ſometimes do good by accident, by cauſing a ſmall revulſion, and by abating the urgent ſymptoms.

Nor will emetics or cathartics yield ſo much relief as is commonly thought, becauſe they often raiſe a diſturbance in the nervous fluid, diminiſh the other fluids, and weaken the expulſive faculty. But much greater benefit may be expected from ſudorifics rightly adminiſtered.

Nothing is more fatal than to hinder the gouty matter, now grown mature, and remaining unexpelled, as well as uncorrected by proper medicines, from falling on the uſual parts, which indeed cauſe great pain, but no danger. If it invades the brain, it will occaſion apoplexies, palſies, a delirium, weakneſſes, dozing, tremors, or univerſal convulſions: If it attacks the lungs, it produces an aſthma, a cough, or a ſuffocation; if the intercoſtals and pleura, a convulſive pleuriſy; if the abdominal viſcera, nauſeas, anxieties, vomiting, belching, gripings, or ſpaſms of the viſcera. It is almoſt incredible how many diſeaſes it creates, which are ſuddenly mortal; or at leaſt not to be cured but by reviving the fit of the gout, which had been diſturbed, and rendering it as ſevere as poſſible.

Theſe laſt mentioned evils happen from injudicious applications of narcotics, refrigerants, aſtringents, or incraſſants; or from medicines which cauſe a revulſion from the diſeaſed part, or from debilitating, evacuating, or ſuffocating remedies. Hence bleeding, purging upwards or downwards, plaſters, poultices, of the nature abovementioned, and all opiates, produce theſe effects; as alſo a ſpontaneous weakneſs brought on by extreme old age; or from the extreme parts being ſo obſtructed, corrupted, withered, or periſhed, that the morbific matter cannot paſs through them any longer.

To abate the exceſſive pain in the part affected, if there be an abſolute neceſſity, opiates may be given internally, and the patient may drink plentifully of hot whey, or any other liquor of the like nature. External emollients and anodynes may be uſed laid on pretty hot, or the part affected may be beat with nettles, or it may be anointed with terebinthinated balſam of ſulphur, or tow may be burnt thereon.

Though there is nothing of any moment to be done in the fit, yet it will be proper to abſtain from fleſh for ſome days, and to live upon water-gruel, or ſuch like diet; but no longer than the ſtomach is averſe to fleſh, for fear of bringing on a diſturbance of the animal ſpirits; but then great care ſhould be taken in the diet, both as to quantity and quality.

As ſoon as the pain is almoſt gone, and the ſwelling and the weakneſs only remain, nothing can be better than warm ſtomachic and ſpicy purges, doſed and repeated according to the ſtrength of the patient. This being premiſed, if the patient's ſtrength is impaired, and his fleſh waſted, give aſſes milk with pearl, half a pint or a pint in a morning early, and at five or ſix o'clock in the afternoon; and to keep up the appetite which the milk commonly palls, and to prevent its cooling effects on the ſtomach, a light bitter made of gentian, cinnamon, and orange-peel only, the laſt double to the other two, infuſed in ſherry or white wine, and taken two hours before meals, may be uſed moſt conveniently. This courſe may be continued two or three weeks; after this a courſe of Bath or German-ſpaw waters with ſteel, riding, a light white food diet, and generous wine drank temperately, will be moſt proper.

Out of the fit, thoſe things are moſt proper which promote the concoction of the aliment, whether by medicines, exerciſe, or diet.

In the diet there is a medium to be obſerved; the patient ſhould neither eat more than the ſtomach will digeſt, nor be ſo abſtemious as to defraud the parts of ſuch a proportion of aliment as is neceſſary to maintain the ſtrength and vigour. As to the quality of the food, the patient's palate is to be conſulted: but he ſhould dine upon one diſh of meat only; for ſeveral kinds of fleſh, eaten at the ſame meal diſturb the digeſtive faculty more than the ſame quantity of any one ſort. As for other things, the

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the patient may feed upon what he likes beſt, provided it is not ſharp, nor ſalted, nor ſeaſoned with ſpices. He ſhould eat no ſupper; but inſtead thereof ſhould drink a draught of good ſmall-beer, whereby the breeding of the gravel may be prevented. If the patient is troubled with the gravel or ſtone, and makes bloody water, he may purge with manna once a week, and take a paregoric at night.

The moſt ſuitable drink is ſuch as is not ſo ſtrong as wine, nor ſo weak as water, for the latter by its coldneſs will deprave the ſtomach. Of this ſort is the London table-beer, or water with a little wine. But, when the gouty matter has ſeized the whole body, he muſt abſtain from all fermented liquors, though ever ſo mild and ſmall.

But if the patient has been uſed to ſtrong or ſpirituous liquors, or is advanced in years, or through weakneſs cannot digeſt his aliment, he may, at meals, indulge himſelf with a draught of Spaniſh wine, which is better than French.

Regard muſt likewiſe be had to the ſymptoms, which, in the fit, endanger the patient's life. The moſt common is a weak and languid ſtomach, attended with ſickneſs and gripes, as if from wind. In this caſe nothing is better than a glaſs of Canary drank now and then, together with exerciſe. But, if the ſymptoms will not admit any truce, give twenty drops of the thebaic tincture in ſpirituous alexitereal water, provided the head is not attacked, and let the patient compoſe himſelf to reſt.

If the nephritic pains ſhould come upon the gout, which often happens, let the patient omit all other medicines, and drink a large quantity of poſſet-drink, in which the leaves and roots of mallows and marſhmallows have been boiled. Then let a clyſter be given, and afterwards a large doſe of laudanum.

When the gout has ſeized on the head, it is to be treated as any other head-each, or as an inflammation of the brain and its membrane; bleeding in the arm or jugular, cupping on the back, and bliſtering between the ſhoulders, but eſpecially on the ancles, to give the gouty humour a vent downwards. In young and ſtrong conſtitutions mercurial and antimonial vomits will do wonders. Likewiſe gentle ſtomach purges are to be poured down continually, that is, two or three ſpoonfuls every third hour, till the effect is obtained.

Mercurial vomits are not only proper for the gout in the ſtomach, but they are abſolutely neceſſary as well as mercurial purges, when the gout becomes fixed to, and permanent in a place, as alſo when it is diſperſed all over the habit like a rheumatiſm. Theſe active medicines muſt firſt render the humours fluid, which gum guaiacum, with diaphoretic antimony, perſiſted in, will afterwards carry off.

Of the SCIATICA, *or* HIP GOUT.

THE ſciatica is a violent and obſtinate pain in the hip, chiefly in the joint where the head of the thigh bone is received into the acetabulum of the coxendix. The pain will ſometimes extend itſelf to the lower part of the loins, to the thigh, leg, and even to the extremity of the foot; yet, outwardly, there is no ſwelling, no inflammation, nor change of colour in the ſkin.

Sometimes there is ſuch a ſpaſm of the muſcles on the ſide affected, that the patient cannot ſtand upright, without the utmoſt pain.

When the ſciatica has continued very long, there is ſuch a collection of pituitous humour in the cavity of the joint, that, by relaxing the ligaments, it often cauſes a luxation. Sometimes it cauſes an aridura, or waſting away of the adjacent parts.

When the pain leaves the hip, and moves downwards, it is a ſign that the ſpaſms are reſolved. A violent motion of the body generally exaſperates the pain.

After a gentle cathartic, or clyſter, bleeding will be proper, eſpecially in the ancle; alſo leeches applied to the hæmorrhoidal veins have been found beneficial. Strong purges are hurtful; but mercurius dulcis given with ſcammony, or ſome other purgative, will be of ſervice.

If the patient is old or weak, lenient purges will be moſt proper; and on the intermediate days a doſe of calomel, which is afterwards to be purged off; and ſo repeated alternately for ſome time.

Baglivi obſerves, that if nothing elſe will do, in pains of the external parts, recourſe muſt be had to cauſtics, particularly the leaves of ranunculus, or a mixture of quicklime and ſoft ſoap, which are beneficial in the hip-gout.

Cheyne obſerves, that when the gout is diſperſed over the whole habit, or is fixed and ſettled on a particular joint, mercurial vomits and purges are neceſſary to diſlodge it; but the ſciatica will not yield to this, and but rarely to any other methods of uſe; but, by the following method, a perfect cure may always be obtained, if the diſtemper is a genuine ſciatica, though of many years ſtanding.

It conſiſts in taking one, two, or three drams, to half an ounce, according to the ſtrength of the patient's ſtomach, of the ethereal oil of turpentine; which is that which comes off between the ſpirit and the oil in drawing off the common oil of turpentine; this is to be taken in triple the quantity of virgin honey, in a morning faſting, for four, five, ſix, or eight days at fartheſt, intermitting a day now and then, as the patient's occaſions require, or his ſtomach ſuffers by it. Large draughts of ſack-whey muſt be drank after it, to ſettle it on the ſtomach, or carry it into the blood; likewiſe every night muſt be taken a proper doſe of Matthew's pills [or half a ſcruple of the *pil. ſaponaceæ*] that is, if the oil has been taken in the morning.

To remove the groſſer remains and ſtrengthen the weakened part, the patient muſt take a dram or two drams of flower of brimſtone, for ſome time twice a day, in a tea-cup full of milk. If through great intemperance, or a violent cold, the patient relapſes, let him repeat the former medicines for a day or two. Then, to ſtrengthen the *primæ viæ* and enliven the ſpirits, let him drink the Bath or Spaw waters with ſteel, and bitters with volatiles.

Of a Virulent GONORRHŒA.

A VIRULENT Gonorrhœa, or CLAP, proceeds from impure coition with an infected woman.

This diſtemper begins and makes its progreſs in the following manner. The patient, ſooner or later, according as the woman with whom he has had converſation was more

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more or leſs infected, and according to his conſtitution, by which he may be more or leſs diſpoſed to receive the infection, is firſt ſeized with an unuſual pain in the genitals, and a kind of ſenſation like a rotation of his teſticles. Afterwards, if the prepuce conſtantly cover his glans, there appears an eruption or puſtule, which by its ſize, colour, and figure, reſembles a ſpot of the meaſles; preſently after appears a weeping matter like ſemen, which daily changes colour, and becomes more purulent and more yellow, till at length, if the diſorder be highly virulent, it aſſumes a greeniſh hue, or appears like a thin ſanious matter mixed with blood.

The puſtule at length becomes an ulcer, commonly called a chancre, at firſt not unlike the thruſh in children's mouths, which, daily eating deeper and wider, at laſt is enccompaſſed with hard and callous lips.

Thoſe whoſe glans is uncovered, ſeldom have ſuch a puſtule, either becauſe it is hardened by being continually expoſed to the air, or by the frequent rubbing of the ſhirt, and ſo is leſs liable to imbibe the infection.

The running brings on a heat or ſmarting in making water, which is moſt violent when it is over, for then it ſeems to burn the whole duct of the urethra.

Another ſymptom is the cordee, or contraction of the frænum, by which the penis is bent downwards. There is likewiſe, when the penis is erected, great pain as if compreſſed tranſverſely with a ſtrong hand. This chiefly happens in the night, when the patient is warm in his bed.

Sometimes the urethra being eaten and excoriated with long running of the acrimonious pus, nature breeds a ſoft ſpongy fleſh, to ſupply the defect, which daily increaſing forms caruncles or carnoſities, ſo far as to plug up the urinary paſſage and ſtop the urine. However, the little adjoining ulcers continue to pour forth a kind of an ichor; and this ſtate is not only troubleſome to the phyſician, but almoſt as bad as death to the patient.

It alſo often happens, through ſome violent motion, or the ill-timed uſe of aſtringents, that the ſanies which ſhould be carried off by the gonorrhœa, is tranſlated to the ſcrotum, and cauſes one or both of the teſticles to ſwell and inflame with intolerable anguiſh and pain; the running at the ſame time decreaſing, while the ſcalding of the urine is as great as ever.

To theſe ſymptoms may be added the phimoſis, which happens when the prepuce cannot be drawn back to uncover the glans; but this the caſe of many in a healthful ſtate. Alſo the periphimoſis or paraphimoſis, when the prepuce, being ſwelled, cannot be brought forward to cover the head of the penis. There are ſometimes alſo watery bladders or veſicles called cryſtallines, and at length buboes or ſwellings of the glands in the groin. When theſe laſt appear, the lues venerea is generally ſuppoſed to begin.

Women are not ſubject to ſuch a variety of ſymptoms as men; their chief complaints being a difficulty of urine, and a running; however, they are liable to chancres and venereal warts as well within as on the outward parts of the labia pudendi, as alſo to buboes in the groin. As for the coarctation of the ſphincter vaginæ, puſing up as it were the external orifice, this is not a phimoſis, though by ſome improperly ſo called.

The cauſe of a virulent gonorrhœa is a taint by impure coition, conveyed from a woman infected with a malignant gonorrhœa, or the lues venerea, firſt to the genitals of a man, and afterwards through the pores to the lymph or ſeminal liquor; the due craſis and natural mixture it entirely deſtroys, by inducing partly a cauſtic and corroding, and partly a putrid ſtate thereof. Hence ariſe the pains and heats, the tumours, the inflammations, and the exulcerations of the genitals: For at firſt the glans is only affected, whilſt, in coition, the poiſon inſinuates itſelf into the open pores. Then it ſoon proceeds to the glans of the urethra, then to the proſtatæ, which are porous, and afterwards to the veſiculæ ſeminales.

If the infected lymph is conveyed to the inguinal glands through the lymphatic veſſels, which Cowper diſcovered to run from the prepuce to the groin; then a venereal bubo is formed, which is a hard tumour without pain. But if the ſeat of the gonorrhœa is deeper, and an inflammation ariſes at the beginning of the urethra, where the veſiculæ ſeminales diſcharge the ſeminal fluid, then theſe veſſels are ſo compreſſed by the tumour, that the ſemen cannot be conveyed to them from the teſticles, whence it happens that the teſticles ſwell.

As to the prognoſtics, we muſt obſerve, that the greater the infection is, the more violent and obſtinate the diſorder will prove; though it ſeldom brings on a pox unleſs the diſcharge is imprudently ſtopped by the prepoſterous uſe of ſudorifics and aſtringents; for, immediately on the ſuppreſſion of the diſcharge, buboes, tumours of the ſcrotum and teſticles, caruncles of the urethra, and other terrible ſymptoms appear, together with a confirmed pox. The more regular the diſcharge is made, the more mild all the ſymptoms are.

But when the running is ſmall in quantity, the urine is highly fetid, and the matter yellow or green, it is a bad ſign.

It is a certain ſign the diſorder is mitigated, when the painful conſtriction of the penis in erection, and the heat of urine, are removed; as alſo when the impaired ſtrength begins to return, and the countenance, which before was pale, aſſumes a florid or a natural colour.

It is a ſign the gonorrhœa is cured, if, upon compreſſing the penis, a drop or two of thin limpid liquor, like the white of an egg, is diſcharged.

The regimen, during the time of the cure, requires the patient to abſtain from all oily food; and he muſt alſo avoid every thing which by its acrimonious quality ſtimulates to venery; ſuch as ſpices, bulbous roots, fleſh, eggs, fiſh, and fermented liquors; for the inflation of the penis retards the cure. This is of the utmoſt conſequence; and therefore all venereal incitements, ſuch as obſcene books, and whatever elſe inflames the fancy, ſhould be ſhunned like death.

Water and whey are the beſt drink, and ſeeds and ſummer-fruits the beſt aliment.

All poſſible care muſt be taken that cold never reach the penis; and that it be kept always moiſt, leſt the pores contracting repel the flux of matter. An emollient and ſomewhat antiſeptic cataplaſm will be beneficial.

In the place of mercurials given internally, Aſtruc di-

reſts the uſe of crude quickſilver, as in the common unction, to be rubbed upon the parts, as about the body of the penis, eſpecially under the urethra to the perinæum, and ſo up to the pubes and teſticles.

Turner approves of this method in all local affections, ſuch as chancres, a phimoſis and paraphimoſis from a venereal taint: As alſo when there is a calloſity in the urinary paſſage, or an induration of the teſticles, particularly their epididymes, left after the hernia humoralis, and the like. Nor does he diſapprove of it in common claps during the courſe of the purgation.

If there is no diſcharge of virulent matter from the penis, it is called gonorrhœa ſicca, or a dry clap, the ſymptoms of which are a dyſury or difficulty of making water, and after, from the increaſe of the inflammation and tumefaction, an iſchury or total ſuppreſſion of urine.

In the cure of the dry clap, Aſtruc adviſes plentiful bleeding in the beginning, to take off the tenſion, and to abate the inflammation; as alſo emollient decoctions of mallows, linſeed, *&c.* in milk, to foment the parts; but perhaps it might be better to make a poultice of theſe ingredients, after Boerhaave's method, to lay to the parts affected; or, which is beſt of all, to uſe them one after the other.

He likewiſe adviſes lenient clyſters, cooling emulſions, and ptiſans with ſal prunella and anodynes between whiles. During the continuance of the inflammation, no mercurials muſt be uſed; and if the ſymptoms increaſe, threatening an abſceſs outwardly in the perinæum, it is to be forwarded as much as poſſible by ſuppurative poultices, and the matter diſcharged.

Of the Cure of the Symptoms.

I. *Of the* Hernia Humoralis, *or Swelling of the* Teſticles.

Astruc, in the cure, recommends frequent bleeding, and an antiphlogiſtic regimen, and fomenting the parts with a decoction of mallow-roots and linſeed; or milk pretty warm; or an anodyne cataplaſm of lily-roots, with leaves of henbane, mallows, and branc urſine, boiled to a mucilage, and mixed with the flower of linſeed and oil of lilies. After the inflammation and fever are abated, he adviſes a gentle purge; after mild reſolvents externally, and antivenereals internally.

The hardneſs of the epididymes is to be diſcuſſed by ſuccinated balſam of ſulphur, mercurial plaſters, and ointments. During the uſe of theſe applications, a ſuſpenſory bandage ſhould not be neglected.

When pus is formed in the teſticles, it muſt be diſcharged with a lancet. If it ſhould leave a fiſtulous ulcer, he adviſes a mercurial ointment.

II. *Of a* Bubo.

Astruc aſſerts, that venereal buboes are of two kinds: the firſt is eſſential, happening immediately after coition with an infected perſon; the ſecond ſymptomatical, which follows the ſuppreſſion of the gonorrhœa, or the drying up of the ulceration. He likewiſe mentions a third, which does not appear ſo early as the other two, and is therefore a pathognomonic ſign of a lues venerea or pox.

He propoſes to cure it by mercurial purges, to carry off the humour; in the mean time rubbing a mercurial ointment into the part, to diſſolve the induration; which he thinks is more gentle and eaſy, than to promote the ſuppuration by ripening poultices, and then opening the tumour by a cauſtic, giving mercurials inwardly at the ſame time.

De Salt cures all the ſymptoms by rubbing into the parts a ſtrong mercurial ointment, cauſing the patient to anoint himſelf from the anus all along the urethra to the glans and prepuce. The following day he gives a ſtrong doſe of jalap, that is, from two ſcruples to a dram. His diet drink is to be ſpring-water in which mercury revived from cinnabar has been boiled. If the patient cannot bear much purging, he may have a truce for a day or two, but the ointment is to be continued every night. The firſt friction gives conſiderable relief, the ſecond yet more, the third commonly makes the pain ceaſe, and the fourth and fifth generally ſilence the complaints. Five or ſix weeks generally perfects the cure.

In buboes, the patient is to rub the ointment into the groin, ſcrotum, and parts in either ſex; purging every day, and drinking the mercurial water; by which means the buboes melt away, the phimoſis, paraphimoſis, and chancres diſappear, and the former health returns. If there is matter already formed in the bubo, then he allows it muſt be opened. Heiſter's method is much the ſame.

III. *Of* Caruncles *and* Carnoſities *in the* Urethra.

The obſtacles which hinder the free paſſage of the urine, according to Aſtruc, are theſe which follow. 1. Ulcers in the urethra. 2. Cicatrices left behind after the healing theſe ulcers. 3. Caruncles. 4. A ſchirrus on the verumontanum, or caput gallinaginis. 5. Indurations of the proſtatæ and veſiculæ ſeminales. 6. Carnoſities riſing in and ſtraitening the canal.

He propoſes to cure the ulcers by the ſame regimen as the firſt period of a gonorrhœa, *viz.* by repeated bleedings, lenients and refrigerants, to abate the fluxion, and take off the inflammation.

Turner, in the worſt caſes, would not have the urethra laid open, but only have the perinæum well greaſed with the mercurial liniment, by which he has known many large calloſities inſenſibly diſſolve, while the candle or leaden probe, ſmeared alſo therewith, has been kept within.

But there has been lately introduced into practice by Daran a new method of curing theſe diſorders with bougies, the compoſition of which he keeps a ſecret.

According to him, if the canal of the urethra be open enough to admit the extremity of the bougie, a ſuppuration will enſue from the diſeaſed part of the urethra, which will in time relax and open the ſtricture; or, if the ſtricture oppoſes the entrance of the bougie, yet ſtill the mere point of the bougie will ſuppurate it in a ſmall degree, and by and by, though much more tediouſly than in the other caſe, by relaxing, open it.

The firſt diſcharge procured by a bougie is generally very ſanious, and evidently flows from the place where the obſtruction is, that part of the bougie only being covered

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covered with matter that anſwers to the obſtruction. Again, the cordee, excited by the uſe of the bougie, is infinitely more painful where the obſtruction is, than in the other parts of the penis. It will, it muſt be owned, produce a cordee in a ſound penis; but then it extends through every part of it, and is by no means ſo painful as the other.

If the ſymptoms of the ſtrictures, callous ſcars, carnucles and tumours of the corpus ſpongioſum urethræ are eſſentially different, thoſe differences are not mentioned by any writer; except that, when the urethra only is affected, the patient, in making water, voids matter before his urine; but when the proſtate glands or veſiculæ ſeminales only are concerned, matter follows the laſt drop of urine. But it frequently happens that one is complicated with the other.

The properties requiſite in a bougie, are a ſufficient degree of firmneſs, that it may be introduced with ſome force: A ſuppleneſs and tenacity, that it may conform to the motions of the body without breaking: A lenient ſuppurative diſpoſition, to bring on a diſcharge without pain: And, laſtly, a ſmoothneſs of ſurface, that it may not only be introduced with more eaſe, but that it may lie eaſy in the paſſage till it begins to diſſolve.

That chiefly made uſe of is as follows;

℞ *Emplaſt. commune. cum pice Burgund.* ℥ij. *Argent viv.* ℥j. *Antimon. crud. pulv.* ℥ß. *M.*

The *emplaſt. com.* or diachylon, muſt be made with oil and a little Burgundy pitch added to it, to render it ſufficiently tenacious; the antimony muſt be finely levigated, that it may give a ſmoothneſs and good conſiſtence to the bougie.

The quickſilver, whether it be divided in *balſ. ſulph.* or honey, muſt not be put into the plaſter till the moment before the bougies are made, nor muſt the plaſter be boiling hot at that time. When the quickſilver is mingled with the plaſter moderately hot, ſlips of fine rag muſt be ready to dip in the compoſition. They muſt be of different lengths, from ſix to nine or ten inches, and about three inches broad. Roll them up looſely, and, taking hold of one extremity with the left hand, let it fall gently on the ſurface of the plaſter, and then draw it out gently. As it is drawn out, it will unroll, and take up a quantity of the plaſter upon its ſurface, equal to the thickneſs of a ſilver groat. It may be proper to aſſiſt the unrolling with a ſpatula. The plaſter muſt be hot enough to ſoak through and diſcolour the rag. The ladle in which it is melted ought to be broad and flat at the bottom; and the plaſter muſt be kept ſtirring, to preſerve it in equal conſiſtence. The bubbles on the ſurface of the cloth may be ſmoothed with an iron ſpatula a little warmed.

One rag will make ſix bougies of a moderate ſize; they are beſt cut with a knife and ruler. They ſhould be made taper at the end, by cutting off a ſlope about an inch and a half long. When they are rolled up, it muſt be with that ſide outward which is covered with plaſter; and they muſt be firſt rolled up with the finger and thumb as cloſe as poſſible, before they are rolled upon a board or marble. In the winter it will be proper to hold them a little before the fire to facilitate their rolling.

Before a bougie of any kind be introduced into the urethra, it will be neceſſary to ſmear it with ſweet oil, that it may go in eaſily, and not ſtimulate too much at firſt. The patient may either ſtand or lie down in the poſture of being cut for the ſtone; then the ſurgeon muſt graſp the penis near the glans, and extend it gently, that the urethra may not be wrinkled, and then it will meet with no impediment but what is occaſioned by the diſeaſe.

It often happens at the beginning, that the bougie cannot be too ſmall; and then the end muſt be round, that it may readily ſlip over the plicæ of the urethra; it is alſo exceedingly deſirable that it enter within the obſtruction. However, it is neceſſary to deſiſt from puſhing it when once it begins to bend. When it meets with any reſiſtance, to avoid the bending, turn it round with your finger and thumb ſeveral times, and, as you turn it, preſs it a little forwards. If by this method it advances, continue to do the ſame thing till it ſtops. But it muſt be owned that the operator in this caſe may be eaſily deceived.

The bougie muſt be confined in the penis by ſome kind of bandage, or rather we may keep it fixed in the urethra by a cotton ſtring tied about its extremity, and then paſſed round the penis; no other thread is neceſſary.

When the patient is timorous, or the part tender, it may be left in two or three hours in a day only at firſt, but otherwiſe ſix or ſeven. When the patient finds he cannot bear it, it may be diſcontinued two or three days, according to the nature of the ſymptoms.

There are inſtances of its having firſt cured, and then brought on a freſh ſtrangury. In this caſe, forbear its uſe for two or three days, and the ſtrangury will ceaſe.

Some have been able to wear it night and day without intermiſſion; and as they withdrew one, introduced another. And this is a prudent ſtep; for the more ſuppuration is procured, and the longer the urethra is kept diſtended, the cure is more likely to be radical. When this cannot be done, the day is better for its uſe than the night, becauſe in the night it is more ſubject to erections.

Two bougies in a day generally anſwer the purpoſe; one in the morning, and one in the evening, as more ſuitable to the patient's avocation; though ſome can walk about with them.

If the teſticles ſhould inflame, or any feveriſh diſorder come on, they may be kept in an hour, or half an hour in a day, to prevent the urethra from contracting again till the ſymptom is removed; to prevent theſe diſorders, the patient ſhould obſerve a cooling regimen during the treatment.

Some are relieved by the bougie in a few weeks, ſome not till many months. Generally the cure may be performed in ſeven, eight, nine, or ten weeks. This is known by the removal of every ſymptom of the diſorder; for ſome degree of running will generally continue as long as the bougie is employed.

When the patient judges himſelf well, it will be beſt to deſiſt gradually, wearing it at firſt only an hour or two in a day, and then two or three times a week, after which it may be entirely left off. If any gleet ſtill remain, or any obſtruction threatens to return, it will be neceſſary to uſe the bougie four or five weeks longer.

In ſuppreſſions of urine it will be always adviſeable to introduce the catheter if poſſible, and indeed to keep it in

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in the bladder two or three or four days; after which, the canal will perhaps admit a bougie, and then, a ſuppuration being once procured, it may eaſily be preſerved open.

IV. *Of a* Gleet.

In what manner, ſays Sharp, a gleet is furniſhed, cannot well be determined, without firſt aſcertaining the exact ſeat of a gonorrhœa. That the lacunæ of the urethra are uſually ulcerated in a gonorrhœa, is now generally aſſented to. Yet though all allow the exiſtence of ulcers during that diſeaſe, they will not admit that a gleet is the diſcharge of an ulcer.

But it is moſt probable, that the running is not all of it a purulent matter, but partly matter, and partly a diſcharge from the ſecretory organs, as alſo from the veſiculæ ſeminales, when they or their ducts are affected. For the running is produced in leſs time after the infection than is requiſite for the formation of matter in every other inſtance; and the appearance of matter is frequently the firſt alarm in a gonorrhœa, the heat of urine and other ſymptoms of an inflammation and ulceration following ſometimes two or three days after.

For theſe reaſons, it is ſuppoſed, that the venereal poiſon, in its firſt operation, irritates only, and thereby increaſes the ſecretion; eſpecially as the ſame thing happens to the glands of the inteſtines from purgatives, from the ſalivary glands, from ſmoaking, *&c.* As the poiſon operates more ſtrongly, the inflammation increaſes, and the ulcers form and extend, when not only the matter from the ulcer is ſanious, but all the ſecretory veſſels communicating with the ulcerated lacunæ ſeparate a thinner fluid than uſual; and both the matter and ſecreted fluids continue to be thin ſo long as the inflammation is violent.

It is even poſſible that in ſome ſlight gonorrhœas, which diſappear in a few days, the venereal poiſon may not have activity enough to bring on an ulceration of the urethra, but only a mere irritation of the lacunæ. Beſides, in other caſes, the quantity of the running is generally much greater, if we may judge by analogy, than a few ulcers in the urethra could poſſibly furniſh. Of this we have almoſt ocular proof in women; for, though the gonorrhœa be exceeding plentiful, yet, upon the niceſt inſpection, we often cannot find the leaſt degree of ulceration of the vagina, though, if the diſcharge was purely the digeſtion of ulcers in that part, it is likely ſome few of them may be viſible.

When the inflammation ceaſes, and the ulcers of the urethra heal at the ſame time, the cure of a gonorrhœa is perfected; on the other hand, if the inflammation be only removed, and the ulcers remain open, a gleet muſt enſue.

It is upon this principle of ulcers ſubſiſting in the urethra, that Daran accounts for the action of his bougie, ſuppoſing it to have the property of healing them with a ſound cicatrix after the urethra is opened. And, if in the operation it can be underſtood when there are ulcers, it will not be difficult to comprehend it when there are none; ſince it ſeems to have the power of opening every unſound cicatrix of the urethra, and bringing them immediately into an ulcerated ſtate.

There are many who imagine that the prodigious increaſe of certain gleets at particular times, laſting only for two or three days, and then ſuddenly abating to their wonted quantity, is inconſiſtent with a purulent diſcharge; and therefore conclude a gleet to be nothing but a preternatural excretion from the relaxed veſſels of the urethra. But it is probable, that, however the matter of a thick gleet may be furniſhed by ſecretion, ſtill the ſtimulus provoking the ſecretion is kept up by the ſubſiſtence of ulcers; and alſo that, when the gleet is very thin and in ſmall quantities, it is the mere diſcharge of thoſe ulcers. A temporary increaſe of a gleet is not wonderful, becauſe habitual ulcers of every other part of the body are often in a fluctuating ſtate, and generally ſuffer from exceſſes of every kind.

Aſtruc, in this diſorder, recommends milk, either of aſſes, goats, or cows, to be drank morning and evening for ſome time; then mineral waters, whether chalybeate or vitriolic, for 15 or 20 days; and afterwards balſamics, to deterge and cicatriſe the ulcers concealed in the urethra, ſuch as balſam of capivi, from 6 to 12 drops, made into a bolus with powder-ſugar; laſt of all, aſtringents to dry up the ulcers, and to recover the loſt tone of the parts, ſuch as infuſions of the leaves of mint, horehound, agrimony, plantain, red roſes, ſhepherd's purſe, ſage, *&c.* or the mint-water of Queretan, ſo often recommended by Riverius againſt obſtinate gleets.

V. *Of* Chancres.

Astruc obſerves, that chancres were the *caries pudendorum* of the ancient writers, and are generally ſeated on thoſe parts which have a fine and tender covering, through which the virulent ſanies, iſſuing from the exulcerated genitals of either ſex, has the eaſier admittance. Such are the inward duplicature of the prepuce, the inſide of the pudenda in women, the nipples of nurſes, the lips and tongue of proſtitutes. In very bad caſes they will appear on the dorſum penis, as well as on the pubes and inſide of the thighs.

In the cure of the recent chancre, he firſt orders bleeding, to abate the inflammation; then fomentations, to reſolve the induration; not omitting mercurials in the mean time, but ſo as to avoid a ſalivation. After which he adviſes the uſe of ſudorific decoctions of china, ſarſaparilla, guaiacum, and ſaſſafras boiled with antimony.

Turner formerly uſed red precipitate ſprinkled on a proper ointment.

Of late years, he ſays, he always found ſmoaking the parts with cinnabar ſucceſsful in chancrous ulcerations on the glans and præputium of men, as well as the labia and ſinus pudoris of women. His method was to throw a dram of cinnabar on a heater or hot iron, letting the fume aſcend through a funnel, or a ſeat perforated like a cloſe-ſtool, all round the diſeaſed parts. This was done every day, and ſometimes twice a day for a week. The iron was hot enough to raiſe flame with ſmoak, but not ſo fiery red as to make it inſtantly conſume away in flame alone.

VI. *Of the* Phimoſis, Paraphimoſis, *and* Cryſtalline.

These are diſorders proper to men, except the cryſtalline; but Aſtruc affirms, that women have ſomething of the

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the ſame nature; and even extends them to their nipples, where the ulceration conſtraining the area or circle round about them irritates the ſame. The phimoſis of women is the conſtriction of the entrance into the vagina.

He begins the cure with bleeding and gentle purgatives, ſuch as *caſſia cum manna* and *merc. dulc.* inſtead of briſker cathartics and emetics, which, as Turner thinks, by making a ſtronger revulſion, afford ſpeedier relief.

He then adviſes anodyne emollient fomentations and cataplaſms to relax and ſoften, and afterwards diſcutients to breathe forth the humours; and, if the penis is ſoaked therein an hour or two twice a day, the effect will be more certain; but if a ſtagnation is threatened, and thence a gangrene, the prepuce is to be divided in the phimoſis on each ſide the glans, and the folds of it to be cut through in the paraphimoſis; by which the ſtrangled glans may be ſet free, and the chancre, if any, brought into view. The like muſt be done for the cryſtalline, in order to diſcharge the impriſoned lymph, and forward the ſubſidence of the prepuce, thereby inflated and puffed up.

The affected parts in women ſhould likewiſe be fomented with the like emollient and mucilaginous decoctions, of the roots of marſh-mallows, white-lily, water-lily, and the leaves of branc urſine, mallows, linſeed, *&c.* ſeveral times a day. Afterwards, a peſſary made of linen or ſponge dipped in the emollient liquor ſhould be introduced into the vagina.

VII. *Of* Tubercles *and* Scirrhous Cords.

The tubercle is a calloſity remaining after healing the chancres of the glans, which hinders the free play of the foreſkin over the glans. If this will not yield to a ſtrong mercurial unction, the only remedy is circumciſion.

The ſcirrhous cords are tubercles which ariſe where there has been an ulceration; and may be left under the ſkin of the penis, ſometimes round, and ſometimes like a cord. They ariſe gradually, and diſappear with the help of a little mercurial unction, and a courſe of mercurial purging, unleſs complicated with other ſymptoms of a worſe kind.

VIII. *Of the* Porri, Condylomata, Chriſtæ, *and the like Excreſcences.*

The venereal porri, whoſe ſeat is the pudenda, if they are recent, ſmall, and ſoft, ſometimes dry and fall off of themſelves, after the poiſon has been deſtroyed by mercurial frictions; but if they are hard, large, and have deep roots, they will ſometimes continue after them, and grow like warts in other parts of the body. In this caſe they muſt be cut with the point of the ſciſſars as near the ſkin as poſſible, and a mercurial plaſter muſt be prepared with a large proportion of mercury, and mixed with *diach. cum gum.* to promote a ſuppuration, and to diſſolve the calloſities at the baſes of the porri, before a cicatrix is formed.

But if the baſis is hard, and ſurrounded with hard and deep calloſities, ſlight mercurial frictions muſt be uſed; and the wound muſt be dreſſed with baſilicon, ſprinkled with red precipitate, to conſume the calloſities by little and little, to ſoften the edges of the ulcers and diſpoſe them to heal. If this ſhould fail, ſtronger corroſives ſhould be uſed.

The ſame directions are applicable to the whole tribe of condylomata, chriſtæ, mora, fici, either about the pudenda or anus.

Of the Lues Venerea, *or* French Pox.

When a gonorrhœa has continued a long while, or long enough for the poiſonous matter to make its way into the blood, or, by aſtringents given unſeaſonably, it cannot make its exit, then the patient is infected with the pox.

The buboes in the groin conſtitute the firſt degree; then follow pains which cruelly torment the head and joints of the ſhoulders, arms, and ancles, coming on by fits, but at no certain intervals, unleſs in the night when the patient is warm in his bed, ſeldom leaving him till towards the morning.

There are alſo ſcabs and ſcurf in various of the body, which are as yellow as a honey-comb, and which diſtinguiſhes them from all others. Sometimes they have large ſurfaces, anſwering the deſcription which authors give of the leproſy. But the more theſe ſcabs are diſperſed over the body, the leſs he is tormented.

All theſe ſymptoms gradually increaſe, eſpecially the pain; which becomes ſo intenſe, that the patient is unable to lie in bed. Afterwards nodes or exoſtoſes ariſe in the ſkull, ſhin-bones, and bones of the arms, which, being attended with conſtant pain and inflammation, at length grow carious and putrefied.

Phagedenic ulcers likewiſe ſeize various parts of the body; but generally firſt begin with the throat, and from thence gradually creep by the palate to the cartilage of the noſe, which they deſtroy, and the noſe, being deſtitute of its prop, falls down flat.

The ulcers and pain daily increaſing, the patient ſinks under the torment; and being not able any longer to ſtruggle with ſtench, rottenneſs, and the loſs of one member after another, his mangled offenſive carcaſe is hurried into the grave.

Beſides the ſymptoms proper to the pudenda and parts adjacent, which have been already mentioned, the following are obſervable in a confirmed pox; which however do not appear in all patients, nor at the ſame time.

I. The ſkin, eſpecially about the neck and breaſt, and between the ſhoulders, is covered with flat ſpots like freckles, of a roſy, purple, yellow, or livid colour, ſometimes diſtinct, ſmall and round like lentils, ſometimes more large and extended.

It is full of itchy puſtules, tetters, and ringworms, a ſerpigo, a herpes miliaris, and exedens. There are chaps in the palms of the hands and ſoles of the feet, with itching, from whence proceeds a clear ſerous liquor, and the epidermis peels off in large flakes.

It abounds with hard, callous, round puſtules, riſing a little on the top, generally dry, but ſometimes moiſt, ſcaly, branny, and yellow; frequently on the corners of the lips, and the ſides of the noſtrils, but more eſpecially on the forehead, temples, and behind the ears, where they appear in rows like a ſtring of beads, and gradually creep among the hair.

The hair not only falls off from the head, but all parts of the body where it grows. Then the nails become unequal,

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equal, thick, wrinkled, and rough; afterwards ulcers ariſe which cauſe them to fall off.

II. The inſide of the mouth, throat, and noſe, are alſo affected; the uvula and tonſils become painful, hot, inflamed, and ulcerated; puſtules appear in the roof of the mouth, which degenerate into round, malignant, phagedenic ulcers, which rot the bone as far as the noſtrils. The pituitary membrane is likewiſe liable to puſtules, which produce malignant ulcerations that infect the bones of the noſe with a caries, particularly the vomer; which being eaten away, the noſe falls down; the voice becomes hoarſe and low; the gums being covered with aphthæ, ulcerate and rot; the teeth ache, grow rotten, and fall out; and the breath is very offenſive.

III. The patient is excruciated with pains in the night-time, when in bed and covered with cloaths: theſe are either tenſive, pricking, pulſative, or rending; fixed or wandering; which ſometimes occupy the muſculous and membranous parts like the rheumatiſm, ſometimes the tendons and ligaments about the joints reſembling the gout; ſometimes they are with tumour or inflammation, ſometimes without.

IV. The bones are affected in various manners; in the middle exoſtoſes ariſe, either ſoft or hard, ſometimes with intenſe pain, ſometimes without. The heads of the bones enlarge every way, but unequally, which produces tumours, pains, difficulty of motion, and ſtiff joints. As the caries increaſes, they become brittle, and break upon the leaſt effort. Sometimes they are ſo far diſſolved, as to bend like ſoft wax.

V. When the lymph is infected, the lymphatic or conglobate glands become hard and callous, and form, in the neck, armpits, groin, and meſentery, hard, moveable, circumſcribed tumours, like the king's evil. The lymphatic veſſels are dilated, extended, and enlarged by a thick ſtagnating lymph, and form ſoft enciſted tumours or gummata: In the tendons it cauſes nodes, in the nerves ganglions, and in the ligaments of the joints tophs.

VI. Neither do the ears and eyes eſcape the fury of this diſeaſe: for the latter are externally affected with pain, redneſs, itching, and lippitude; and internally, being loaded with humours, the ſight is deſtroyed, and ſometimes a ſuppuration ſupervenes. If the vitreous humour of the eyes is thickened, it cauſes a glaucoma; if the cryſtalline, a cataract; if the aqueous, hairs or ſpiders webs ſeem to float in the air.

The ears are affected with a ſinging noiſe, hardneſs of hearing, deafneſs, and pain, whilſt their internal ſubſtance is exulcerated and rendered carious.

After this catalogue of ſymptoms, it is no wonder that all the animal, vital, and natural functions ſhould be depraved, the face be pale and livid, the body emaciated and unapt for motion, and that the patient ſhould fall into an atrophy and maraſmus.

Women have diſorders proper to the ſex; as, cancers in the breaſt, a ſuppreſſion or overflowing of the menſes, the whites, the hyſteric paſſion, an inflammation, abſceſs, ſcirrhus, gangrene, ulcer and cancer of the womb. They are either barren or ſubject to abortion; or the children they bring into the world have an univerſal eryſipelas, are half rotten, and covered with ulcers.

The methods of curing the pox are principally four: 1. The common, by ſalivation; 2. By giving quickſilver pills; 3. By mercurial frictions, which are to be purged off before a ſalivation is raiſed; 4. By ſweating, with a decoction of guaiacum.

The ſafeſt and moſt commodious method of ſalivation is by mercurius dulcis ſix times ſublimed, given inwardly in the milder pox; or by mercurial unction, when the diſeaſe is got into the bones.

Fifteen grains of mercurius dulcis may be given in a morning, and the like doſe at night, with *electar. e ſcordio*. After three, four, or five days with this management, we uſually obſerve the fauces to inflame; the inſides of the cheeks to be tumid, or high and thick, being ready to fall within the teeth, upon ſhutting the mouth; the tongue looks white and foul, the gums ſtand out, the breath ſtinks; and the whole inſide of the mouth appears ſhining, as if parboiled, and lying in furrows.

The inſide of the mouth thus beginning to be wheated, you may expect ſoon to ſee them ulcerated, eſpecially about the ſalival glands, which empty themſelves thereinto. Now it may be proper to deſiſt a day or two, to obſerve the increaſe of the ulcers, what ſloughs are like to be raiſed, and what their depth and dimenſions are like to prove; from which a near conjecture may be made of the duration as well as quantity of the ſpitting now begun, and the conſiſtence of the drilling lympha whether more or leſs fluid.

When the ſalivation is thus begun, your only buſineſs is to encourage your patient chearfully to go on. Let his diet be ſmall chicken-broth, water gruel, and panada. His drink, ſmall ſack-whey, or poſſet-drink, with a draught of good ſmall-beer with a toaſt between whiles.

Thus, after ſome days reſpite, if, after the ſpitting comes on, you find the patient hearty, his chaps but little ſwelled on the outſide, and as little ſore within, the ulcers not increaſing, with few or no ſloughs appearing therein, the flux alſo inconſiderable in quantity, you may now give a ſcruple of *merc. dulc.* in *elect. e ſcord.* at going to reſt, repeating it two or three days following, as you find occaſion, and then wait the iſſue again. This is the ſafeſt and moſt prudent method.

If he ſhould have taken half an ounce of calomel, with little alteration as to the ſwelling and ſoreneſs of his mouth, and as little appearance of his ſlavering, his pulſe and other circumſtances favouring the ſame, and no ill ſymptom appearing, you may vomit him with viij or x grains of turpeth mineral in conſerve of roſes, or mixed with x or xv grains of calomel, encouraging the operation with ſmall draughts of common poſſet-drink between whiles, upon each motion to reach, but not loading the ſtomach therewith, as is cuſtomary in other emetics. If there is occaſion, it may be repeated two or three days after, which will forward the ſalivation more effectually than more doſes of calomel ſimply repeated would have done.

If a ſalivation cannot be raiſed to any quantity, as in ſome it cannot, you muſt forbear and purge it off, and give calomel once or twice a-week, and purge it off the next day, or two days after.

When the ſpitting goes well forward, it may be left to take its courſe till it declines of itſelf; which, in proportion.

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portion to the ulcers and thickneſs of the ſloughs about the parts of the mouth, may happen at the end of twenty-one days, or a month from its riſing; that is, from the time of ſpitting a pint and a half a-day, till it comes to three pints, or even five pints, in twenty-four hours, when it gradually goes off again. For often the firſt four or five days, or a week, are ſpent in bringing it to the firſt proportion.

In the more ſtubborn and rebellious pox, attended not only with cruel night pains, gummata, tophs, nodes, and alſo rotten or foul bones, if the patient has been uſed to mercurials, or if ſalivated before, then the cure muſt be attempted with ſalivation by unction.

You may mix an ounce of quickſilver with three ounces of axungia; of which, an eighth part is to be uſed night and morning, letting the patient rub it in with his own hands gently by the fire, beginning with his ancles up to his ſhins and knees, all round his joints, and ſo to his thighs, which are preſently after to be covered with yarn-ſtockings and flannel drawers; then let him uſe what remains of his eighth part about his elbows and ſhoulders, wiping his hands clean about the glands of his arm-pits, or thoſe of his groin. His body, during the unctions, ſhould be ſkreened from the cold with a blanket hung behind him, and then be wrapt up in a warm flannel; that is, he muſt have a flannel-ſhirt, waiſtcoat and drawers, a cap, a muffler pinning it up thereto behind, and covering all his throat, chin, and cheeks before, to defend them from the cold air. The ſame things are requiſite in the former way. The weak need only be anointed once a-day.

If, when the ointment is divided into four parts, after the third unction the patient begins to complain of his chaps, you muſt ſtay a day or two before you proceed farther: The ſame when gripes or bloody ſtools approach.

Where there are a gummata, tophs, and nodes, the ointment muſt be chafed particularly into thoſe parts, and then apply the mercurial plaſter upon them. If the ſpitting declines too ſuddenly, give a ſcruple of calomel every day, or every other day, for two or three times, as you ſhall ſee occaſion.

When he is a little recovered, and his chaps pretty well, he may eat a little chicken, veal, rabbit, or mutton, well roaſted, without ſauce or gravy.

The patient ſhould be prepared for a ſalivation by a lenitive purge or two; and, if plethoric, he ſhould bleed: Likewiſe bathing in warm water, for ſome hot, lean, emaciated people, has been found ſerviceable. Women ſhould be laid down juſt after their menſtrual flux is over. Temperate weather is the moſt ſuitable.

If the patient is troubled with ſickneſs and vomiting; if mild, give him freely of a ſmall chicken-broth, poſſet-drink, or thin water-gruel, refreſhing him with a little mulled wine between whiles. But if there is a cardialgia, and intolerable pains at the mouth of the ſtomach, with inceſſant vomiting, ſpaſms of the members, fainting, cold ſweats of the forehead and eyebrows, the patient is in the utmoſt danger, and you muſt ceaſe giving mercury, and if poſſible turn it downwards, by directing the common clyſter with 2 or 3 ounces of brown ſugar, and as much oil-olive.

To prevent the jaws from being locked up, it is neceſſary to uſe a bit of ſtick covered with a ſoft rag, which muſt be held between his backward teeth: But, if there ſhould happen an adheſion of the inſide of the cheek to the gum, hindering the patient from eating and opening his mouth, the ſame is to be carefully divided.

If, during the ſalivation, a blood-veſſel burſts open, make a little pellet of lint, and cover it with the fine powders of alum or vitriol, or dip it in the tinctura ſtyptica, and thruſt it cloſe down into the cavity, which will ſecure the effuſion, being held tight with the finger for a little while. If it happens from the ſeparation of the ſloughs from the ſide of the cheeks, a little oxycrate held in the mouth will do the buſineſs, or an aſtringent decoction of oak bark.

If the patient has been without a ſtool for ſome days, give an emollient clyſter of warm milk, ſugar, and oil. At this time he may drink freely of ſmall beer with a toaſt, barley-water, ſmall ſack-whey, or poſſet-drink. For diet, water-gruel, oatmeal-caudle, ſmall chicken or veal broth, a roaſted pippin, or a few ſtewed prunes.

If, notwithſtanding your care in giving ſmall doſes of mercury, the fauces ſhould ſuddenly inflame and tumefy, endangering a ſuffocation of the patient, the moſt certain relief is to bring the humours downward by ſharp clyſters, and, if he can ſwallow it, a cathartic by the mouth.

An ozæna, or ulcer of the noſtril, is beſt cured by a cinnabarine fumigation, which ſubdues the malignity, dries up the ulceration, and diſpoſeth the caries, if any, to a ſeparation beyond all others after which, and ſometimes before, calomel muſt be given and purged off; or, if there are other ſymptoms of a profound infection, you muſt ſalivate by unction.

The like method muſt be uſed for ulcers of the palate, uvula, and tonſils. The fume rarely fails to ſtop the farther eroſion, and therefore it is always to be directed, though a ſalivation is intended. It cures, in two or three days time, the moſt putrid and corroſive venereal ulcers, or after the ſecond or third ſmoking.

Aſtruc diſapproves of any other method of ſalivation but by frictions; and he would have pure mercury ground in a mortar, with juſt ſo much turpentine as will reduce it into a brown or black powder, and mix with it equal parts of freſh lard, and ſo well mixt, that the particles of the mercury ſhall not be viſible by a magnifying glaſs. He alſo allows that occaſionally there may be double the quantity of lard.

He diſtinguiſhes the frictions into weak and ſtrong; for the ſtrong he allows not leſs than two drams of the ointment, nor more than four. The firſt time, the patient is to be anointed from the feet to the calves of the legs; two days after, from thence to the middle of the thigh; then the third time, as far as the buttocks. If after the ſeventh day there appears no ſign of a ſalivation, you muſt proceed to the fourth friction, from the buttocks along the loins and back to the neck, with a large quantity of ointment. If on the ninth day nothing appears, another friction muſt be from the wriſts to the ſhoulders.

During the ſalivation, he allows the patient, if he has ſtrength, to get up ſometimes, and ſit by the fire; or, if he cannot, to ſit up in bed: when he lies down, he would have

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have him lie in as prone a poſture as he can, that the ſaliva may be evacuated more eaſily, and not fall into his ſtomach.

In the weak or ſlight friction he allows from one to two ounces of the ointment. The firſt friction is to be only on the feet; the ſecond on the legs; the third on the knees; the fourth on the thighs; the fifth on the buttocks and perinæum; the ſixth on the loins; the ſeventh on the back and between the ſhoulders; the eighth and ninth, if there is occaſion, from the arms to the wriſts. There may be three, four, five, or even ſix or ſeven days between each friction, if the patient is very weak: But the rule is, to look into the patient's mouth before a new friction, that you may be certain not to bring on too plentiful a ſalivation. The doſe of the ointment muſt be ſo managed, that, after the fourth or fifth friction, a ſalivation may come on that is gentle, eaſy, governable, without a ſwelling of the head; with only a few aphthæ in the mouth, or at moſt a few ſuperficial ulcers, and the patient not ſpitting above a pint or two in twenty-four hours: and to this point it muſt be kept up, with a new friction, if there be occaſion. Likewiſe it may be kept under with clyſters and plentiful drinking of the ptiſan; and, if neceſſary, with lenitive purges. This treatment may be continued, *pro re nata*, from 30 to 50 days, or longer.

Till the ſalivation comes on, the patient may be indulged in weak ſoups, rice, cream, panada's *&c.* and even milk for breakfaſt; but after that they muſt be left off; and he muſt drink a large quantity of ptiſan to dilute the blood. He may ſit up all day, if his room be warm.

If, after a due repetition of mercurial frictions, a ſalivation does not appear, it generally happens that a looſeneſs, a flux of urine, copious ſweats, or at leaſt a plentiful tranſpiration, will ſupply that defect, and ſerve in its ſtead. In this caſe, the patient may think himſelf exceeding happy and fortunate, that he has obtained a complete cure by a method more certain and convenient than by ſalivation, and without its incommodities and dangers.

The ſecond method of curing the pox is by a quickſilver pill. This was brought into reputation by Belloſte; and though he has kept the compoſition a ſecret, yet there is no reaſon to doubt but it is quickſilver mixed with a certain proportion of a cathartic.

The third method of curing the pox is by mercurial frictions, which De Salt gives as follows:

When the patients have a pox of a long continuance, and the venereal poiſon is diſperſed all over the body, they ſhould be prepared by bathing and drinking whey. But in a recent pox the bath is not neceſſary, or at leaſt need not be uſed long, becauſe the blood is ſufficiently diluted.

After this, inſtead of raiſing a ſalivation, bring on a flux of the belly; the whole ſecret of which conſiſts in keeping the body open by clyſters of a decoction of ſenna and the pulp of caſſia, before the frictions are adminiſtered; by which the inteſtinal glands being opened, the mercury will more readily tend that way. When the looſeneſs does not anſwer the number of the frictions, nor the quantity of the mercury made uſe off, purge the patient with powder of jalap, and procure copious ſtools, which ſecure the mouth. While the looſeneſs is going on, the friction does the office of a purge; and in proportion as they are repeated, the flux of the belly revives; and when it ſlackens or ſtops, have recourſe to the clyſters and purges of jalap. Purſue this method till the ſymptoms ceaſe, and till, by the abundance of the evacuations the venereal poiſon is entirely drained off.

The laſt method is ſweating with ſtrong decoctions of guaiacum. This we have the firſt account of from Sir Ulrick Hutton, who purſued it himſelf. A pound of guaiacum is to be boiled in a gallon of ſpring-water to one half, and the ſcum reſerved to anoint the ſores, and a ſecondary decoction was to be uſed for common drink.

But, when ſalivations and other mercurial courſes have failed, the beſt method of cure is by the root of ſarſaparilla; which diſcovery we owe to Dr Hunter, who put Mr Fordyce, a ſurgeon in the army, upon making a trial of it; the reſult of whoſe experience is as follows.

1. It will commonly relieve venereal head-achs and nocturnal pains in a very ſhort time; and, if perſiſted in, he believes it will always cure.

2. In emaciated and conſumptive habits, from a venereal cauſe, it is the greateſt reſtorer of the appetite, fleſh, colour, ſtrength, and vigour, that he knows.

3. When the throat, noſe, palate, or the ſpungy bones in general, are affected with a ſlough or caries, it will commonly complete the cure, if perſevered in long enough, provided a mercurial courſe by unction has preceded the uſe of the ſarſaparilla.

4. When the body is covered with dry blotches or moiſt ſores from a venereal cauſe, it will greatly promote the cure, nay often complete it; but, without the aſſiſtance of mercury, there will be danger of a relapſe.

5. In ſimple chancres it will do little ſervice; but, if it is given in caſes where the chancres or buboes will not heal or diſſolve after the uſe of the mercurial unction, it will often cure, and do always manifeſt ſervice.

6. It will often anſwer, and that ſpeedily, without ſweating, confinement, or any ſtrict regimen, at all ſeaſons of the year, when mercurial unctions and long continued courſes of ſtrong decoctions of guaiacum, either by itſelf ſimply, or compounded with a ſmall proportion of ſarſaparilla, have failed.

7. It ſeems probable, that ſarſaparilla root is the only medicine to be depended upon in venereal caſes where mercury has failed, or at leaſt has preceded the uſe of the decoction; for it is not to be truſted alone. When no mercure has been given, it and this decoction may be adminiſtred together, and then there will be no room to doubt of ſucceſs.

8. Mercury alone will cure moſt venereal complaints, and ſarſaparilla will perhaps always cure them when they reſiſt the power of mercury; and therefore a proper combination of mercury and ſarſaprilla will probably cure every caſe that is truly venereal.

The method of uſing it is this; to three ounces of the ſarſaparilla root, which has not been ſpoiled with age, worms, ſea-water, or moiſture, add three quarts of river-water, and make it boil as ſpeedily as poſſible, in an open veſſel, till two pints of the ſtrained liquor remain, that is, about two pounds avoirdupoiſe weight; a little liquorice-

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liquorice-root added to it will make it more palatable. This quantity is enough for twenty four hours, and may be given at two or three doſes either warm or cold. It muſt be made freſh every other day, and what is not uſed on the day it is boiled muſt be kept in a cold cellar. The patient ſhould live abſtemiouſly while he takes it, particularly with regard to wine.

There is another compendious and efficacious method of curing the lues venerea, which has formerly been attempted by the ſame medicine, but in a different manner, and not with the ſame ſucceſs.

Dr. Pringle recommended a method of curing the lues venerea, which at firſt was brought into a regular practice by baron Van Swieten. His method conſiſted in giving corroſive ſublimate in French brandy or moloſſes ſpirits. The proportion was a grain of the mercury to two ounces of the ſpirits; and his common doſe was from half an ounce to an ounce, or, which is the ſame thing, from one ſpoonful to two, twice a-day; adjuſting the quantity to the ſtrength of the patient and to the virulence of the diſeaſe. The operation was either by ſweat or urine, eſpecially when the medicine proved moſt ſucceſsful. It was continued as long as any of the ſymptoms remained, with a low, ſpare diet, plenty of barley-water, and a little milk, or ſome ſuch diluting liquor.

Of the Yaws.

The Yaws is a diſtemper endemical to Guinea and the hotter climates in Africa; but has of late ſpread by infection over many parts of Europe. All are liable to it, but more eſpecially in childhood or youth.

It makes its firſt appearance in little ſpots on the cuticle, not bigger than a pin's point, which increaſe daily, and become protuberant like pimples. Soon after, the cuticle frets off; and then, inſtead of pus or ichor, there appear white ſloughs or ſordes, under which is a ſmall red fungus. Theſe increaſe gradually, ſome to the ſize of a ſmall wood-ſtrawberry, others to that of a raſpberry, others again exceed the largeſt mulberry, which in ſhape they very much reſemble. In the mean time, the black hair in the yaws turn to a tranſparent white.

It is not an eaſy matter to determine the exact time which the yaws take in going through their different ſtadia. Luſty well-fed negroes have had ſeveral yaws as big as a mulberry in a month's time; whereas the low in fleſh, with a ſcanty allowance, have paſſed three months, without their growing to the ſize of a ſtrawberry.

The yaws appear in all parts of the body, but they are moſt plentiful and of the largeſt ſize about the groin, privy-parts, anus, arm-pits, and face. They are largeſt when feweſt in number, and *vice verſa*. They are not painful unleſs handled roughly, nor cauſe a loſs of appetite. They continue long without any ſenſible alteration; and whether they would not in time, when the peccant matter is exhauſted through the ſkin, vaniſh of themſelves; or turn to corroſive ulcers, and affect the bones with nodes, exoſtoſes, and caries; or, by enlarging the excretory ducts of the miliary glands, cauſe a fluid to tranſude more viſcid than ſweat, which by drying on the ſkin would render the patient ſcorbutic, ſcabby, or leprous; is hard to ſay. It is an infectious diſeaſe.

The yaws are not dangerous, if the cure is ſkilfully managed at a proper time; but if the patient has been once ſalivated, or has taken any quantity of mercury, and his ſkin once cleared thereby, the cure will be very difficult, if not impracticable.

The negroes who have been cured in Africa never have them again in America.

As ſoon as the yaws begin to appear on a negroe, he muſt be removed to a houſe by himſelf; or, if it is not certain whether the eruption is the yaws or not, ſhut him up ſeven days, and look on him again, as the Jews were commanded to do with their lepers, and in that time you may be commonly certain.

As ſoon as you are convinced that it is the yaws,

Take a ſcruple of flowers of ſulphur; five grains of camphorated ſpirit of wine; a dram of Andromachus's treacle; and a ſufficient quantity of ſyrup of ſaffron. Make them into a bolus, to be taken at bed-time.

Repeat this bolus every night for a fortnight or three weeks, or till the yaws come to the height; that is, when they neither increaſe in ſize or number: Then throw your patient into a gentle ſalivation with calomel given in ſmall doſes, without farther preparation; five grains repeated once, twice, or thrice a-day, is ſufficient, as the patient can bear it. If he ſpits a quart in twenty-four hours, it is enough. Generally, when the ſalivation is at this height, all the yaws are covered with a dry ſcaly cruſt, or ſcab; which, if numerous, look terribly. Theſe fall off daily in ſmall white ſcales, and in ten or twelve days leave the ſkin ſmooth and clean. Then the calomel may be omitted, and the ſalivation permitted to go off of itſelf. A dram of corroſive ſublimate diſſolved in an ounce of rum or brandy, and the ſolution daubed on the yaws, will clear the ſkin in two days time. After the ſalivation, ſweat the patient twice or thrice.

He may likewiſe drink the decoction of guaiacum and ſaſſafras fermented with moloſſes, for his conſtant drink.

Sometimes there remains one large yaw, high and knobbed, red and moiſt; this is called the maſter-yaw. This muſt be conſumed an eighth or a tenth part of an inch below the ſkin, with equal parts of corroſive mercury and burnt alum, and digeſted with an ounce of yellow baſilicon and a dram of corroſive mercury, and cicatrized with lint preſſed out of ſpirits of wine, and with the vitriol ſtone.

To children under ſix or ſeven years old, at the proper time of ſalivating, [when the yaws are come to their full growth,] give a grain or two of calomel in white ſugar, once a-day, one in two days, or once in three days, ſo as only to keep their mouths a little ſore till the yaws dry, and, falling off in white ſcales, leave the ſkin clean. This ſucceeds always, but requires a longer time than in adults.

The venereal diſeaſe and the yaws ſeem to be very diſtinct diſtempers; but the ſymptoms, in conſequence of the yaws ill cured, coincide ſo exactly with the ſymptoms of an inveterate French pox, that in moſt caſes it will be very difficult if not impoſſible to diſtinguiſh them.

Of the Scrophula, *or* King's Evil.

The King's evil is attended with hard, ſcirrhous, and often

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often indolent tumours, which arise by degrees in the glands of the neck, under the chin, armpits, groin, hams, arms, and wrists; but it is most commonly seated in the neck, and beneath the ears.

Likewise cold tumours, which appear on the joints and bones, as on the knees, elbows, hands, and feet, but more particularly on the fingers, are disorders of the scrophulous kind: as also the greatest part of those obstinate fluxions, which fall gradually on the joints, without a manifest cause; and which are attended with an abscess, a caries, and swelling of the bones, called the *spina ventosa*; especially of the apophyses and epiphyses. Of the same kind are likewise the oedemata or white swellings which arise in the arms, legs, and feet, principally about the joints. They consist of a jelly or coagulated lymph, which puffs them up, but do not pit when pressed with the fingers like dropsical swellings.

In the eyes the scrophula creates inflammations; in the eye-lids a puffing up of their edges with great soreness and small ulcers; in the angles of the eye a fistula lachrymalis, by ulcerating the gland planted there for the percolation of tears; in the lips, excessive and preternatural thickness; in the nose it often creates the crusty ulcer called ozæna. All which, except the last, are often the forerunners of this disease, antecedent to the great swellings and foul ulcers which appear in its maturer state.

The glands of the external parts are not alone attacked with this disease; for those of the mesentery are almost always affected; which appears from the opening of persons dying of this disease. Sometimes the disease begins in the mesentery; and sometimes the liver, spleen, womb, lungs, windpipe, brain, and other internal parts, are scrophulous: Hence scirrhous tumours, incurable cancers, obstinate fluxions, rebellious ophthalmies, malignant abscesses, fistulous ulcers, dangerous quinseys, terrible epilepsies, mortal consumptions of the lungs, stubborn jaundices, dropsies, cholics, hypochondriac and hysteric affections.

The scrophulæ are hard tumours, because they are produced by a thick coagulated matter; they are cold, because they are caused by a stagnation of the lympha in the part affected.

The scrophulæ may be said to be benign, when they are superficial; when they do not much raise the skin, nor change its colour; when only the glands are puffed up, and are soft, moveable, without adhesion and indolent.

The malignant scrophulæ are evident from the largeness of the tumour, its hardness and adhesion; from its becoming livid or red; from its being painful; and, when ulcerated, from the callosity of the lips of the ulcer, and from their difficult cure.

As to the prognostics; the benign scrophulæ admit of an easy cure, especially if they are seated in the conglobate glands, and are moveable, superficial, and soft. Those which attack the joints, the tendons, the ligaments, the bones, which are near large vessels, or compress the aspera arteria, or the oesaphagus, are very difficult to cure. The internal scrophulæ are much more dangerous than the external; for when they turn to an abscess, they are incurable. They are also more or less troublesome in proportion to the progress they have made, the parts which they attack, and the temperament of the patient. If the strumæ have been long ulcerated, and are become sinous and virulent, and if they lie near one another, they often find a communication, though they appear distinct: In this case the lips grow callous, and the ulcers corrosive, frequently sordid; and the cure is not to be expected as long as one cystis remains of the vessels that feed them. Those who are seized with strumæ in the neck after forty years of age, seldom recover.

If strumous tumours arise from a caries in the bones of the fingers or hands, the cure is difficult; but more so in the feet and toes. If in the os calcis, joint of the ancle, or astragalus, or in the knee-bones, or ischia, or the like, where they cannot be safely laid open, the case is deplorable, and the patient generally dies of a marasmus.

In the cure, the diet should be thin and attenuating, light and easy of digestion; and all salt and smoke-dried meat should be carefully avoided; as also beef, pork, fish, hare, cheese, and in general all things that are hard of digestion, or which yield indifferent nourishment. The air should be pure, sweet, and dry; and the body should be kept always open.

The cure may be begun by bleeding, especially if the patient is plethoric, and then a mercurial or antimonial vomit; after which he should take a gentle purge, often repeated, such as the common purging potion of Sydenham; and, as almost all remedies which are good in venereal cases are useful in this, mercurial vomits and purgatives will be proper.

Some give ethiops mineral alone for three months; beginning with twelve grains, and increasing the dose gradually to a scruple, or half a dram, and decreasing in the same manner.

It is certain that the united force of mercurials and antimonials will do wonders in these cases, if prudently given and long continued; always beginning with small doses at first.

Some make use of the decoction of sponge; the dose is four ounces: others, burnt or calcined sponge; the dose is half a dram morning and evening. Turner mentions a cure from an electuary made of the most gritty and sabulous sponges that could be got, which were dried in an oven so much as to be fit to pulverize. The dose was a spoonful night and morning.

Others recommend the absorbent powders and diaphoretic antimony; others again, tincture of antimony in a glass of the decoction of the woods; Dr Francis Fuller, the decoction of colts-foot used for a long time. Fallopius praises the root of butchers-broom; the dose is a dram with x. gr. of the root of common flower-de-luce. *Arn. de Villanova* looks on the root of scrophularia or figwort as a specific; the dose is a scruple in powder. And Allen mentions two cures performed by white archangle, boiled in milk, which it coagulates; the whey of which must be drank, and the curd applied to the sores. Of late the mineral waters of Moffat in Annandale have been drank with great advantage.

Epsom salt dissolved in a pint of water in such a quantity as to keep the body open, and taken like sea water, has often cured this disease.

After all, we have another medicine whose virtues in curing this disease have been lately celebrated, *viz.* the jesuits bark.

1. Take of the best rhubarb, half an ounce; of florentine

rentine orris, an ounce; of dried red roſes, a dram and a half. Infuſe theſe, after they have been cut and bruiſed, in two quarts of ſmall ale; and let the patient drink a glaſs of the colature twice a-day, with the quantity of a nutmeg of the following electuary:

2. Take of the powder of the Peruvian bark, ſix drams; of ſaſſafras bark in powder, two ounces. Make them into an electuary with a ſufficient quantity of the ſyrup of ſugar.

Dr Fothergill has likewiſe long given the bark in ſcrophulous diſorders, and affirms that it may not only be given with ſafety, but to manifeſt advantage in many of theſe caſes.

He gives the bark in a liquid form, in the following manner:

3. Take of Peruvian bark in powder, an ounce; and boil it in a quart of pure water to a pint. Towards the end, add of ſliced liquorice-root half an ounce. To the colature add of nutmeg-water two ounces, and mix them. The doſe is two, three, or four ſpoonfuls, with ten, twenty, to forty drops of the volatile tincture of guaiacum, twice or thrice in a day.

A ſmall quantity of winter's bark, added to this medicine, gives it a grateful warmth, and renders a quantity of the compound water leſs neceſſary; and a little liquorice, a few raiſins, gum arabic, or the like, added to the decoction before it is taken off the fire, by making the liquor viſcid, enables it to ſuſpend more of the fine particles of the bark, and at the ſame time renders it leſs diſagreeable.

The ſwellings of the joints, commonly called white-ſwellings, are of the ſtrumous kind, and of two ſorts: they are both made by congeſtion, and increaſe gradually; the one ariſes externally upon the tendons, and between them and the ſkin, or between them and the bone; the other internally, within the bone itſelf.

That which ariſes externally affects the ligaments and tendons firſt; and ſometimes relaxes them to ſuch a degree, that the heads of the joints frequently ſeparate one from another, and the member waſtes away and grows uſeleſs. But moſt commonly the humours, by overmoiſtening the ligaments and tendons, produce a weakneſs and uneaſineis in the joints, raiſing a tumour externally, and, in its progreſs, the membranes and bones are corroded by the humour. It will be more certain that the tumour is the offspring of the king's evil, if there are ſtrumous ſymptoms in any other part of the body

In order to the cure, in the beginning of the fluxion, apply aſtringent and drying plaſters of red lead and bole, with moderate bandage, and place the member in ſuch a poſition as may prevent the deſcent of the humours. The internal remedies may be the ſame as in the general cure. Cheyne and Allen ſay, water pumped on the tumour is a certain remedy.

Of the CANCER.

A CANCER is a hard, round, unequal, painful, and generally immoveable tumour, of a livid, blackiſh, or leaden colour, ſurrounded with ſwelled, crooked, varicous veſſels, in ſome ſort reſembling the feet of a crab, from whence this tumour takes its name.

A cancer is either occult or manifeſt. An occult begins at firſt with a ſmall and almoſt indolent tumour, about the ſize of a pea, or a hazle-nut, which does not change the colour of the ſkin, and ſometimes lies dormant for ſeveral years without making any progreſs.

But as ſoon as the virulent humour begins to become more active, the ſmall tubercle becomes all of a ſudden a large, round, livid tumour, with an unequal ſuperficies. It is generally attended with an intenſe ſhooting pain. At length it begins to eat and break through the ſkin, and ſo becomes a manifeſt or ulcerated cancer, from whence proceeds a ſordid, viſcid, bloody, ſanious or ichorous matter, attended with an inſupportable ſtench.

Though a cancer may infeſt any part of the body, it generally appears in the breaſts, armpits, behind the ears, in the lips, noſe, and private parts: women are more ſubject to them than men. Its general ſeat is the glands, and is a-kin to a ſcirrhus.

An occult cancer is known to be formed, when, after the ſigns of a preceeding ſcirrhus, a titillation, itching, heat, redneſs, are gradually perceived, with a ſhooting, burning, pricking pain. The colour of the ſkin likewiſe changes from a carnation to a deep red; then it becomes purple, blueiſh, livid, and at length black: The part feels very hard, unequal, and rough; then it riſes with an apex in the middle; the ſwelling increaſes, and the adjacent veins become tumid, knotty, varicous, thick, and black.

When it begins to break, the ſkin is excoriated, and there tranſudes through it a thin ſharp ichor.

After this the ſound veſſels on the edges of the cancer, being diſtended by the riſing of the tumour, are broken; hence ariſes a putrefaction, which turns into a ſubtil, ſharp, fetid, cadaverous ſanies, which, corroding and eating away the ſound parts, makes a progreſs in depth as well as in circumference, and ſends forth malignant roots, by which it takes faſt hold; the lips become tumid, parched, and offenſive to the ſight: the pain is intolerable, with a ſenſe of burning, pricking, and gnawing; the colour becomes cineritious, livid and black. Afterwards ariſe occult cancers communicating with the glands; hæmorrhages; convulſions; a ſlow fever; a general waſting; loſs of ſmell; callous tubercles in the ears without pain; fainting fits. The parts being thus eaten away and conſumed, death enſues.

In perſons of a good habit, an occult cancer may be pretty eaſily borne; but if it be diſturbed, the preceding ravage muſt be expected.

A ſmall, incipient, free cancer, ſeated in a ſuitable place, not joining to large veſſels, ariſing from an external cauſe, in a juvenile, ſound body, and being the only one in the body, ſhould be extirpated without delay.

Outward applications of all kinds, except the plumbeous and narcotic, are to be ſhunned, becauſe they have a tendency to ulcerate an occult cancer.

If the cancer be large, old, adherent, in a place unapt for extirpation, growing to or lying upon large veſſels ariſing,

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ariſing from an internal cauſe; and the patient being old, diſpoſed to theſe kind of diſorders, and having more than one; neither exciſion nor topics are proper.

For unleſs it be extirpated, root, branch, and ſeed, it will be exaſperated, and ſtrike inwards, generate others, and increaſe thoſe already formed.

The cauſe of a cancer muſt be taken away with it, or before an attempt of that kind is made.

A cancer of the fauces, palate, armpits, or groin, is incurable; of the lips is hard to cure.

When a cancer is large, *&c.* as above-mentioned, all we can do is to leave it at reſt, and to appeaſe the ſymptoms.

The firſt point is obtained by defending it from external injuries, by applications conſiſting of plumbeous ingredients and narcotics; by diminiſhing and correcting the cauſe. For this purpoſe cathartics with mercurials in a ſmall, and ſometimes in a double doſe, will be proper; as alſo diluents, aperients, and ſubalkalious remedies; taking care not in any manner to increaſe the cauſe.

When the cancer is ulcerated, if it cannot be taken off, it ſhould be kept as clean as poſſible, and be appeaſed with the moſt ſoft ſaturnine applications.

Mr Gataker has found, that the ſolanum hortenſe, as well as the lethal, otherwiſe called belladonna, has had ſurpriſing effects in the cure of obſtinate pains, ulcers without malignity, ſcorbutic eruptions, and even cancerous ulcers of the face, and ſcrophulous ſores on the thighs. Junker affirms belladonna has cured a moſt deplorable cancer of the breaſt. The doſe of either is a grain or two at night going to bed, which ſometimes makes the patient giddy at firſt. Three will often vomit, ſweat, or purge the patient moderately. Boiling water muſt be poured upon the herb, which muſt be afterwards ſqueezed out.

Of the Elephantiasis, *or* Leproſy *of the* Arabians.

The leproſy is ſaid to be of two kinds; that of the Greeks, and that of the Arabians. The latter is called elephantiaſis, from the roughneſs, inequalities, and tubercles in the ſkin, reſembling that of an elephant. Lucretius ſuppoſed it to be generated in Egypt, and no where elſe; but if the leproſy of the Jews is the ſame as that of the negroes, which is highly probable, then we may affirm that it is endemical to the ſouthern and inland parts of Africa.

That it was contagious, all hiſtories agree, as well ſacred as profane; and the Perſians would not let a leprous perſon come within the city-walls.

Pliny informs us, that the firſt appearance of the elephantiaſis is in the face, particularly a ſmall ſpeck appears on the noſe or noſtril; and, as the diſeaſe increaſes, the whole body is full of ſpots of various colours; the ſkin is thick in one place, and thin in another, hard and rough, with ſcabs. In proceſs of time, the ſkin turns black, and the diſeaſe eats away the fleſh to the very bones. Celſus obſerves, that the ſpots grow tumid and red, and then turn black, and the ſkin is covered, as it were, with ſcales. Then the body falls away, the mouth, legs, and feet ſwell, and the fingers and toes are hid with a ſwelling; even the bones themſelves do not eſcape; afterwards a fever ariſes, to which the patient falls an eaſy victim.

But to ſet this matter in a ſtill clearer light, it will be neceſſary to add the deſcription of this diſeaſe from *Guido de Chauliac*. The leproſy, ſays he, commonly begins in the face and forehead, in which filthy tubercles make their appearance, and by degrees ſpread all over the body. The eyebrows ſwell; the noſtrils grow wider outwardly, and ſtraiter inwardly; the lips are diſfigured with an unſightly tumour; the voice is hoarſe and ſnuffling; the ears are turned back; the forehead is protuberant; the face is of a purple colour; the veins under the tongue are varicous and black; the muſcles between the fore-finger and the thumb are eaten away; the hair falls off from the head and eyebrows; afterwards the ſkin of the whole body becomes black and full of ſpots, rough and unequal, with cruſty ſcabs full of knobs and fiſſures, of horrible aſpect, which makes it appear like the ſkin of an elephant. After this, the fingers and toes begin to ſwell; and then the legs, which, being covered with rugged inequalities, ſeem like two ſacks for magnitude. Beſides all this, the patient is inſatiable with regard to venereal pleaſures. The blood is fetid, ſpotted and black, and will not coagulate.

This diſeaſe is hereditary and infectious: for it may be caught by the ſaliva of a leper, if a ſound perſon drinks after him; by touch; by lying in the ſame bed; and by coition.

An inveterate leproſy was judged to be abſolutely incurable. But Aretæus ſays, when the diſeaſe is new and recent, there are hopes of a cure. What he and Celſus preſcribe in order to the cure, are not worth repeating; for, if any medicines will do, they muſt be of the Herculean kind. Authors are exceſſive in the praiſe of viper's fleſh, which Hoffman judges to be quite inſignificant. Joel adviſes bleeding and purging, with xij grains of the extract of black hellebore, or iij gr. of the glaſs of antimony in conſerve of roſes; but the vitrum ceratum is more ſafe, and may be given in a larger doſe. Towne confeſſes, that antimonial preparations yielded moſt relief in Barbadoes; but he could not ſay that they perfected the cure. On the other hand, mercury exaſperated the diſtemper, irritated the ulcers, and made them ſpread the faſter.

Of the Impetigo, *or* Leproſy *of the* Greeks.

This diſtemper begins with red pimples or puſtules breaking out in various parts of the body; ſometimes they appear ſingle; ſometimes a great number ariſe together, eſpecially on the arms and legs: as the diſeaſe increaſes, freſh pimples appear, which joining the former make a ſort of cluſters, all which enlarge their borders and ſpread in an orbicular form. The ſuperficies of theſe puſtules are rough, whitiſh, and ſcaly: when they are ſcratched, the ſcales fall off; upon which a thin ichor oozes out, which ſoon dries and hardens into a ſcaly cruſt.

Theſe cluſters of puſtules are, at firſt, ſmall and few, that is, three or four in an arm, or leg only, and of the ſize of a ſilver penny. But, if the diſeaſe is ſuffered to increaſe, they become more numerous, and the cluſters enlarge their circumference to the bigneſs of a crown-piece, but not exactly round. Afterwards it gradually increaſes in ſuch a manner that the whole body is covered with a leprous ſcurf.

Willis

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Willis blames all dried and ſalted meats, eſpecially hog's fleſh; and fiſh, particularly ſhell-fiſh, becauſe the poor people in Cornwal, inhabiting near the ſea coaſt, were formerly much ſubject to leprous diſeaſes, and had many hoſpitals erected on that account.

In the method of cure, ſays Hoffman, we ſhould endeavour to diſcharge out of the body the maſs of corrupt, glutinous, and acrid humours, by ſufficient bleeding and abſtinence, and by purges, as well gentle as draſtic; then, by proper aliment and a good regimen, promote the generation of wholſome juices; and, likewiſe by external, deterſive, conſolidating, and drying remedies, to free the parts from pains, tumours, itching, and ulcers.

The purges may conſiſt of the root and the reſin of jalap, the extract of black hellebore, elaterium mixed with calomel, or ethiops mineral, and gum ammoniac.

Among thoſe things which ſtimulate the ſolid parts to an excretory motion, and more powerfully melt down the tenacious humours, the lignum and cortex guaiac. exceed all others, as they will generally alone cure the lues venerea. The moſt conſiderable, beſides theſe, are the tartarized and acrid tincture of antimony, ſulphur of antimony, cinnabar, and, if a venereal taint is ſuſpected, a decoction of crude antimony. Which medicines, in a convenient doſe, in the morning, with purifying decoctions drank in bed, afford very great relief.

But, if theſe fail, recourſe muſt be had to mercury, which ſome, after extinction, mix with flowers of ſulphur and camphor, and rub it on the joints to promote a ſalivation: others more properly give mercurius dulcis, with double the quantity of crabs-eyes and calx of antimony, riſing gradually from three or four grains to a ſcruple, in order to ſalivate; with the uſual precautions. The cure may alſo be performed with alterative and diaphoretic preparations of mercury, ſuch as mercurius ſolaris and jovialis; of which a few grains may be exhibited every morning in conſerve of roſes for ſome weeks, drinking in bed after it a pint of ſome proper decoction.

But it muſt be obſerved, that each of theſe methods of cure requires an air very temperate, a ſpare thin diet, and an abſtinence from fat, and boiled fleſh, and acids.

Of the Itch.

The itch is a cutaneous diſeaſe, ariſing from a corruption of a ſerous lymphatic matter, ſometimes attended with mild, ſometimes with more obſtinate and dangerous ſymptoms. The itch of the milder ſort appears either with moiſt or dry puſtules, at firſt about the joints, and from thence ſpreads by degrees over all the body, the head only excepted. In the moiſt ſort, to which children and the ſanguineo-phlegmatic are moſt ſubject, the puſtules are more full of a purulent matter, attended with a ſlight inflammation, which is manifeſt from the redneſs which appears round about them till it ſuppurates. The dry ſort chiefly attacks thoſe that are lean, old, or are of a melancholico-choleric conſtitution: In theſe, the puſtules are much leſs, and excite a moſt intolerable itching, eſpecially in the night-time. The moſt uſual places where the eruptions appear very numerous, and the itching is greateſt, are between the fingers, on the arms, hams, and thighs.

This diſeaſe is, truly and properly ſpeaking, a diſeaſe of the ſkin; becauſe it often is ſafely cured by topics alone, if timely applied. It is contagious, and may be caught by drawing on a glove or ſtocking, wiping on the linen, or lying in ſheets after perſons infected with this malady. Some think it owing to an impurity in the ſerum, and ſome to animalculæ. But however that be, it often affects ſuch who have been long kept in priſon, who lead inactive lives, and are uſed to live in a ſluttiſh naſty manner, or who conſtantly eat fiſh or fleſh dried in the ſmoak or ſun, and uſe any other unwholeſome food or drinks; or who live in a cold, moiſt, and cloudy air, which, hindering a free perſpiration, cauſes a ſtagnation of humours in the ſuperficies of the body, which are for that reaſon liable to corrupt.

The milder ſort of itch is no way dangerous, and very eaſy to cure; but the moiſt more eaſy than the dry. While it is recent and ſuperficial, it much ſooner yields to remedies, than when it is deep, and has infected the maſs of blood; and the caſe is ſtill worſe, if there be any fault in the viſcera: it is more difficult in old perſons than young; in a leuco-phlegmatic or hydropical diſpoſition, as alſo in a very dry hectic one, it is hard to cure; and, when it becomes univerſal, it may bring on the leproſy.

The patient ſhould avoid ſhell-fiſh, and all ſalted and high-ſeaſoned meats; as alſo wine, ſpiritous liquors, ſtrong beer, and every thing elſe that may inflame the blood. For this reaſon a ſlender diet is beſt, unleſs perſpiration be obſtructed.

If the body is phlethoric, we are to begin by bleeding, and afterwards to purſue it by purging, which cannot ſafely be omitted.

Inſtead of repeating purging, it is common to give flowers of ſulphur in milk, or treacle, with good ſucceſs.

Willis and many others have a great opinion of the efficacy of ſulphur uſed both internally and externally; to which Turner aſſents, except in hectic and conſumptive caſes. But Shaw thinks it is not to be depended on when outwardly uſed. Yet it is very certain that poor people find a great deal of benefit who drink it inwardly with milk, and uſe it outwardly with butter, or hog's-lard.

Turner prefers the ſalt of tartar to moſt other remedies, it thoroughly purging and cleanſing the blood taken inwardly, and, made into a lixivium with ſpring-water, is an excellent waſh outwardly.

When the blood is thought to be foul, it will be proper to uſe diet-drinks, through the whole courſe, of the roots of china, ſarſaparilla, oxylapathum, ſcorzonera, chichoreum, glycyrrhiza, polypodium, the barks of ſaſſafras, cinnamomum, the ſhavings of the woods of ſaſſafras, and the like; which will ſtrengthen the ſolid parts, and dry up ſuperfluous humidities.

It has been a very common practice to cure the itch by quickſilver girdles; but Turner thinks them too hazardous to be brought into regular practice, and Shaw ſeems to be of the ſame opinion.

But after all this, if the diſeaſe ſhould prove ſo ſtubborn as not to give way to the moſt powerful of the preceding methods, recourſe muſt be had to ſalivation as the dernier reſort, which will prove effectual when every thing elſe fails; which, however, is not to be made uſe of till

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the caſe is ſo deſperate as to render it abſolutely neceſſary.

Of Hæmorrhages *in general.*

The blood, which flows ſpontaneouſly, generally proceeds from thoſe places which are of a fine and thin texture, in whoſe ſurface the ſlender veſſels creep along with various meanders; ſuch as the inward part of the noſtrils, the bronchia of the lungs, the fleſh of the gums, the left ſide of the ſtomach, the gut ilium, and the extremities of the rectum, as alſo the external ſubſtance of the womb and vagina. When theſe parts are diſtended, and the ſmall arteries open, the blood often breaks out with violence.

Sometimes, though but ſeldom, hæmorrhages happen in other places where the veſſels lie deeper; as from the little finger, from the hand and knee, the breaſts in the time of menſtruation. There are likewiſe inſtances of periodical fluxes from the penis in men.

They generally happen to perſons whoſe bodies are of a ſoft, ſpongy, tender texture, and whoſe veſſels are turgid with blood and ſerum. Theſe were formerly ſaid to be of a ſanguine conſtitution, and are ſubject to hæmorrhages as long as they live. But the choleric, who have larger veſſels, whoſe fibres are more ſtrongly braced, and whoſe blood circulates with greater rapidity, are liable to a ſpitting of blood in their youth. The ſanguineo-melancholic are ſubject to the bleeding piles; and women who are ſanguineo-phlegmatic, are obnoxious to vomiting blood.

Boys and youths are moſt ſubject to bleed at the noſe; in young men the blood ſeeks an exit from the lungs, whence hæmoptoes and conſumptions; the middle-aged are more liable to hæmorrhoidal evacuations, and decrepid old men to piſſing of blood.

Hæmorrhages are moſt frequent at the ſpring and fall; hence ſanguineous apoplexies at thoſe ſeaſons, which are nothing elſe but eruptions of the blood in the middle of the brain. Vomiting and piſſing of blood are more frequent in the autumn. In ſome, theſe excretions happen periodically.

When hæmorrhages proceed from a fulneſs of the veſſels, they conduce to the preſervation of health; but when they are cauſed by a poiſonous acrid matter, as in malignant and ſpotted fevers, they are exceeding dangerous. Alſo when they are derived from an infarction, induration, and corruption of the viſcera, eſpecially of the liver, ſpleen, or lungs, they are generally fatal, becauſe they bring on a cachexy, dropſy, the black diſeaſe of Hippocrates, and a mortal hectic.

Of Bleeding *at the* Nose.

A Hæmorrhage at the noſe is owing to the more plentiful appulſe of blood to the noſtrils by a ſtrange motion of the heart, whereby the ſmall arteries in the pituitary coat become turgid, and too much diſtended, till at length they gape, and the blood ruſhes out.

A bleeding of the noſe may be promoted when perſons of ſedentary lives that indulge their appetites, and ſo become plethoric, put their blood into extraordinary agitation by violent paſſions and exerciſe, by ſpirituous liquors, ſpices, heating volatile medicines, hot baths, or ſuddenly chilling their feet.

Likewiſe the ſudden change of air from hot to cold, and cold to hot, by fits, eſpecially at the equinoxes, may cauſe this bleeding; as alſo when from cold and moiſt the air becomes highly elaſtic, and *vice verſa*. Thoſe, moreover, are liable to it who are afflicted with rheumatic, nephritic, arthritic, and iſchiadic pains, or who have fevers or ſpaſms. It ſometimes happens before the eruptions of the ſmall pox and meaſles, and to thoſe who have loſt a large limb, or who labour under obſtructions of the liver and ſpleen; hence, in an inveterate ſcurvy, dropſy, and cachexy, there often happens a fatal hæmorrhage.

It differs much as to the quantity; ſome loſe only a few drops, ſome ſeveral ounces, and ſome five or ſix pounds. No hæmorrhage is more apt to return; which it does to ſome in a few days, to others in a few hours.

To the plethoric it is generally ſalutary; and there are many inſtances of a vertigo, a ſcotomia, dull heavy pains of the head, a phrenzy, and even an epilepſy, being carried off by a bleeding at the noſe. On the contrary, from its ſuppreſſion there have ariſen vertigoes, apoplexies, epilepſies, convulſions, noiſe in the ears, and hardneſs of hearing, and even a gutta ſerena.

Theſe hæmorrhages are critical and ſalutary in a ſynochus on a ſemicritical day, that is, between the third and fourth, or on a critical day, *viz.* the ſeventh: for, as theſe fevers are generally cauſed by a plethora, they are carried off that way.

But enormous and long-continued bleedings at the noſe, when they ariſe from ſpaſms of the internal parts, and are preceded with coldneſs of the extreme parts, and fainting fits, generally terminate in death.

After a revulſion by bleeding, there is nothing equal to nitre to appeaſe the orgaſm of the blood, and to relax the ſpaſtic ſtricture. Next to theſe are vegetable acids; ſuch as the juice of Seville oranges, barberries, the water and juice of wood-ſorrel; but more eſpecially the diluted ſpirit of vitriol, tincture of roſes, made with the water of wood-ſorrel and the ſpirit of vitriol, and drank with ſpring-water. [Five or ſix ſpoonfuls of the common tincture of roſes may be given at a time, and repeated as occaſion requires.]

If the bleeding is very inordinate, it will be proper to uſe cooling emulſions, gentle or ſtronger opiates to moderate the ſpaſtic ſtrictures, as occaſion ſhall require. Camphor, mixed with nitre and calx of antimony, will be highly neceſſary, if the matter of exanthemata or cutaneous eruptions is the cauſe of the hæmorrhage, as is often the caſe.

A revulſion may be made from the head, by bleeding in the lower parts; then by temperate pediluvia, and putting the hands into warm water.

As there is often an acrid bilious matter lodged in the hypochondria, the parent of wind and ſpaſms, the powder of rhubarb will be proper, mixt with a few grains of tartar-vitriolate and nitre; as alſo emollient and carminative clyſters, with a due proportion of oil.

Externally, refrigerants may be mixed with diſcutients, and applied to the forehead, noſe, and neck.

But

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But it muſt be noted, that, when the patient is plethoric, the bleeding muſt not be ſtopped haſtily, if at all; nor when the menſes in women have been ſuppreſſed, or the lochia, or the bleeding piles in men accuſtomed thereto; much leſs muſt a ſtoppage be attempted when the bleeding itſelf is periodical.

In perſons of a bilious conſtitution, cold water alone, drank freely, has had a good effect.

The cachectic ſhould perſiſt long in the taking of rhubarb, either alone, or mixed with digeſtive ſalts, ſuch as tartar-vitriolate. If there is any ſcorbutic diſorder in the viſcera, beſides rhubarb, the patient ſhould drink plentifully of whey.

If any diſeaſe proceeds from the ceſſation of this cuſtomary hæmorrhage, it ſhould be promoted with a pen or a ſtraw thruſt into the noſe.

Some recommend the weaker ſpirit of vitriol, and would have eight or ten drops of it be given in every draught of liquor. But perhaps the beſt method of all in obſtinate hæmorrhages is that recommended by Mead in the bloody ſmall-pox; or the Peruvian bark alone will generally be ſufficient.

Of the Bleeding *and* Blind Piles.

A Flux of blood from the hæmorrhoidal veſſels is called the bleeding piles; when the veſſels only ſwell and diſcharge no blood, but are exceeding painful, they are termed the blind piles.

All copious fluxes of blood from the anus are not to be reckoned of the morbous kind. For the habit of body, ſtrength, age, and temperament, are to be conſidered. That which is enormous and exceſſive to one perſon, may be be moderate and ſalutary to another. That only is to be eſteemed pernicious, which continues too long, and enfeebles the patient; whereby digeſtion, nutrition, and other functions are hurt, and there is reaſon to fear the production of dangerous chronical diſeaſes.

An exceſſive hæmorrhoidal flux is generally preceded by a heavy preſſing pain of the back and loins; ſometimes a numbneſs of the legs and thighs; a conſtriction of the external parts, with a ſlight ſhivering, and a ſubſidence of the veſſels therein; a hard contracted pulſe; a dryneſs of the mouth and fauces; the urine diminiſhed in quantity, and moſt commonly pale; a ſenſe of weight about the anus extending to the perinæum; a weakneſs of the ſtomach; a flatulency in the lower belly; a frequent deſire to make water and to go to ſtool, with ſometimes an excluſion of white bilious mucus; the old and weak have a procidentia ani

In this caſe, the blood is generally at firſt black and very grumous, and ſometimes comes away in large clots from the varicous veſſels; afterwards it becomes red, and at laſt ſerous: ſometimes it is pituitous, or like the white of an egg. There are inſtances of voiding a pint or a quart of blood daily; it often continues long, from twenty to thirty, or even forty days.

This flux entirely proceeds from the hæmorrhoidal veſſels. The external or blind piles ſeldom bleed, but turn to painful varices; which being opened weep a little, but will not yield much blood. But the internal piles, which are the offspring of the ſplenic branch, and are extended to the inner ſubſtance of the rectum, and as far as the ſphincter of the anus, together with the ſmall arteries derived from the lower meſaraic, not only bleed plentifully, but, when the flux is ſuppreſſed, create diſeaſes of the liver, ſpleen, pancreas, meſentery, and inteſtines.

The perſons ſubject to this diſeaſe are thoſe of a looſe, ſpongy texture, of a bulky ſize, who live high, and lead a ſedentary life; or to whom it is hereditary. Sharp purges, aloetics, high-ſeaſoned food, free drinking of ſweet wines, neglect of cuſtomary bleeding, anger, ſadneſs, hard riding, and the like, will uſher in this diſorder.

This hæmorrhage is dangerous, becauſe it decays the ſtrength, waſtes the body, and produces a ſenſe of weight in the thighs. The ſleep is laborious, and the præcordia oppreſſed; there is a rumbling in the belly, and a weak pulſe. When it continues long, the ancles ſwell, and the countenance is ghaſtly; there is a ſtraitneſs of breathing; and laſt of all it terminates in a cachexy, dropſy, or a ſlow and hectic fever.

If the patient is plethoric, bleed; and let his drink be cold water of the chalybeate kind, or whey turned with orange-juice; or juleps made with tincture of roſes, cooling waters, and ſyrup of roſes; likewiſe nitre in powder, with abſorbents and ſtrengtheners; and, to appeaſe the ſpaſms, opiates of the mildeſt kind.

If it continues long, and the flux begins to be ſerous, then give rhubarb with curants or tamarinds, or, which is much the ſame, with cream of tartar. Then gentle diaphoretics may be compounded of burnt hartſhorn, calx of antimony, wine-vinegar mixed with crab's-eyes, water of elder-flowers, ſimple alexitereal water, and diaſcordium; or hot decoctions of yarrow, veronica, *&c.* may be taken in bed, in order to ſweat; alſo half a grain of camphor, mixed with nitrous and bezoardic powders.

In the Blind Piles there is a moſt intenſe pain, eſpecially at the time of going to ſtool, and the excrements are tinged with blood. Sometimes tumours like warts lie hid in the ſphincter, or appear in the verge of the anus.

Sometimes the veins, in the blind piles, are ſo much dilated with blood as to be very painful, and raiſe tubercles as large as peas, grapes, or eggs: They appear livid, and black, from the ſtagnation of a thick blood, and, when preſſed with the fingers, feel like a bladder filled with liquor. Some are ſoft and indolent; others hard, inflamed, and painful; render the patient unable to walk, ſtand, or ſit; and produce ſuch a ſpaſm in the anus as not to admit a clyſter. Sometimes they bleed, or turn to troubleſome itching ulcers, and occaſion an abſceſs or a fiſtula.

Linen dipped in warm ſpirits of wine, and emollients, are often of infinite ſervice; and, when they fail, leeches may be applied to exhauſt the blood: If they are not at hand, and the parts are inflamed, the lancet muſt be uſed; then dreſſings muſt be made with lint, with compreſſes and the T bandage. The tubercles, which are full and large, may be removed by a ligature, unleſs inflamed. Sometimes they are high in the rectum; and then a ſpeculum ani muſt be uſed; in which caſe they muſt be either ſcarified with a lancet, or divided with ſciſſars, that the thick noxious blood may be diſcharged, and the pains relieved.

Of

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Of the Immoderate Flux *of the* Menses.

The ſymptoms which attend this diſorder, are loſs of ſtrength, anxiety of the præcordia, fainting, coldneſs of the extreme parts, paleneſs, convulſions, ſuffocations; and, when it is inveterate, oedematous ſwellings of the feet, a cachexy, dropſy, the fluor albus, a hectic fever, and an atrophy.

Sometimes the flux returns twice in a month; and at others continues ſeveral days longer than uſual. It comes ſometimes before and ſometimes after abortion. Sometimes florid blood ruſhes out with impetuoſity, moſt frequently before a miſcarriage, and after it from a retention of part of the after birth, which keeps the orifices of the veſſels open. Sometimes clots of blood come away of the ſize of an egg, when the menſes have been ſtopped for two or three months. A black, grumous, coagulated blood will now and then come away on the firſt days of child-bed, when the patient is ſlender and plethoric. In the cachectic, the flux will be often thin and watery; in the ſcorbutic corrupt and fetid, attended with ſharpneſs and pain.

It is ſometimes cauſed by a great afflux of blood to the uterus, which is not returned in due quantity by the veins; for which reaſon the veſſels often burſt. The ſame happens from a plethora, and from hard labour. About the fiftieth year, when the menſes ceaſe ſpontaneouſly, a great and ſometimes dangerous flux will happen, and then quite diſappears. If it ſhould ſuddenly and unexpectedly return about ſixty, with flooding, it brings on a fatal hectic fever.

This diſeaſe is generally preceded and accompanied with a tenſion and inflation of the hypochondria; a heavy, preſſing pain about the loins, with a chilneſs; as alſo a coldneſs of the extreme parts, a ſubſidence of the veſſels, a paleneſs, a quick pulſe, an inward heat, a coſtiveneſs, and little urine.

If a child-bed woman is not ſufficiently cleanſed at her lying-in, a great hæmorrhage will follow ſome months after, with fainting fits, and will not terminate till the excretion of a carnous maſs as big as one's fiſt, which the ſex call a mole.

If the body is cacochymic, and full of depraved juices; ſcorbutic, or infected with the venereal lues; when the viſcera are unſound, and the liver, ſpleen, and meſeraic veſſels are ſtuffed with a black, thick blood; this diſeaſe is not without danger. The patient's life is greatly in danger when the child is dead before delivery, and a great flux of blood happens. It is dangerous when cauſed by a violent extraction of the after-birth; or when pieces of it are left behind, which afterwards become moles, and greatly vitiate and increaſe the menſtrual flux.

If the patient is plethoric, bleed in the arm. If there is an orgaſm in the blood, diluents, humectants, and refrigerants, will be moſt efficacious: in this caſe ſpring-water may be drank alone, or with a little nitre, or with ſpirit of vitriol and ſyrup of poppies; the ſpaſms require gentle opiates. To carry off the impure ſerum, two ounces at leaſt of manna muſt be given, with a dram of cream of tartar in an aqueous vehicle. If the flux is obſtinate, recourſe muſt be had to aſtringents.

Thomſon of Montroſe recommends an improvement of Helvetius's ſtyptic powder; which conſiſts of two parts of crude alum, and one of dragon's blood; whereas Thomſon's is equal parts of each; and the alum is to be burnt in a crucible, and the dragon's blood added to it, and afterwards powdered. Mead has three parts of burnt alum to one of dragon's blood.

He ſays he never found this medicine fail in uterine hæmorrhages, whether to correct the too frequent return of the menſes, or their too great abundance, or to ſtop the flooding of women with child, or to moderate the flux of the lochia.

The quantities which he gives are more or leſs, according to the exigencies of the patient. In violent bleedings, half a dram every hour; and three drams or half an ounce ſeldom or never fail to ſtop the flux.

Of a Hæmorrhage *from the* Urinary paſſages.

This diſorder is commonly called piſſing of blood; and is an emiſſion of blood with or without urine, from the veſſels of the kidneys or bladder, which may be either enlarged, broken, or eroded. It is more or leſs dangerous, according to the different circumſtances which attend it.

If pure blood is voided ſuddenly without interruption and without pain, we may conclude it proceeds from the kidneys. It likewiſe comes from the kidneys, if the urine is coffee-coloured or more florid, and generally precedes a fit of the gravel, but ſometimes accompanies the paſſage of a ſtone through the ureters. But if the blood is ſmall in quantity, and of a dark colour, with or without purulent matter, chiefly if it is emitted with heat and pain in the pubes, it certainly proceeds from the bladder. This is ſometimes attended with fainting, difficult breathing, a low, ſmall, and frequent pulſe, a nauſea, anxiety, and cold ſweats.

When it proceeds from the ureters, which are hurt by a large, rough ſtone, and a ſmall quantity of blood is mixed with the urine, there is a ſharp pain in the loins and ilia, and a difficulty of making water, which when made has a fabulous ſediment, and other ſigns of a ſtone ſticking in the ureter. When the coats of the bladder are hurt by a ſtone, and a little blood follows, it is attended with a moſt acute pain and a previous ſtoppage of the urine, together with grumes and fabulous concretions; which alſo ſometimes happens when a ſtone is firmly fixed in the kidney.

It may be occaſioned by a ſtoppage of the hæmorrhoidal flux; from violent motion of the body, eſpecially riding; from a ſtone concealed in the kidney: from an eroſion and ulcers of the bladder; from external violence; from griping pains cauſed by violent purges; from ſharp diuretics, eſpecially cantharides.

All bloody urine has ſome degree of danger; but it is moſt ſo when mixed with purulent matter.

If the patient is plethoric, or if it proceeds from the ſuppreſſion of a ſanguineous evacuation, bleeding is neceſſary; as alſo cooling nitrous draughts, and purified nitre mixed with abſorbents, with whey for a vehicle, or barley-water,

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water, or ſmall-beer, acidulated with ſome drops of the ſpirit of vitriol. The body muſt be kept open with laxatives, as rhubarb with currants, or with cream of tartar; as alſo emollient clyſters. The relaxed veſſels muſt be agglutinated with decoctions of vulnerary herbs; ſuch as agrimony, ground-ivy, yarrow, golden rod, and the roots of comfrey dulcified with virgin-honey, to which milk may be occaſionally added. Almond milk is likewiſe good, eſpecially if uſed as a vehicle with bole-armeniac.

If there is an ulcer in the kidneys or bladder, medicines muſt be given that ſheathe the acrimony; ſuch as ſyrup of marſhmallows; alſo infuſions of the vulnerary herbs above mentioned; likewiſe of the bark of the roots of acacia and cherry-tree gum.

When grumous blood plugs up the paſſage of the ureters into the bladder, or the ſphincter of the bladder, and occaſions a difficulty or ſtoppage of urine, warm water drank plentifully, and baths of the ſame, are uſeful; likewiſe warm water ſhould be injected into the bladder with a ſyringe, that the ſharp humour may be diluted and the grumes diſſolved. But, if the urine ſhould be quite ſtopped with a ſpaſm, then give emulſions of the four cold ſeeds, with crab's-eyes and calx of antimony; or a powder made of ſperma ceti, crab's-eyes, and nitre. Externally, apply a bladder filled with the decoction of emollient flowers in milk to the abdomen; and keep the body open with manna, or an emollient oily clyſter.

Milk and whey are likewiſe excellent in theſe diſorders, if a dram of bole armeniac is taken in every draught.

Of the LETHARGY, CARUS, *and other ſleepy diſeaſes.*

THE lethargy has ſome affinity to the apoplexy and palſy, and often attends them.

By ſleepy diſeaſes are meant a preternatural propenſity to ſleep, ſometimes attended with, and ſometimes without a fever: The immediate cauſe of which is a very languid and diminiſhed influx of the animal ſpirits from the cortical part of the brain into the medulla oblongata, and from thence into the nerves deſtined for ſenſe and motion.

There are ſeveral kinds of theſe diſorders, the principal of which are a coma vigil, a coma ſomnolentum, a carus, and a lethargy.

A coma vigil is known by theſe ſigns: a burning and extenſive pain in the head, attended with a ſenſe of ebullition therein; they have a ſtrong inclination to ſleep, and yet either don't ſleep at all, or, if they do, awake immediately with little relief, but have no delirium. This coma differs from the pervigilium, which is frequent in acute fevers, for in this there is no propenſity to ſleep. This diſorder is always ſymptomatic, and often attends acute, burning, and malignant fevers; as alſo an inflammation of the dura mater, and uſhers in a phrenſy.

In a coma ſomnolentum, the patients are languid, and their chief complaint is a conſtant drowſineſs. They often fall aſleep at their meals, in converſation, and in the midſt of buſineſs, and, when they are awaked, ſoon fall aſleep again. This diſorder principally ſeizes old men, who live luxuriouſly, and neglect bleeding. It is a primary diſeaſe, and without a fever.

A carus is a profound ſleep, out of which the patient cannot be roufed by clamours, ſhaking, nor even with the pricking of a needle; or, if they are ſenſible of the pain they continue ſilent, and fall aſleep again. It is ſometimes a primary diſeaſe, and ſometimes ſymptomatic. When it is ſymptomatic, it is of three kinds: The firſt happens in acute fevers, in the beginning or increaſe; and, if the convulſions and hiccups ſupervene, it is ſoon fatal. The ſecond comes after acute fevers; and, when the patient is exceeding weak, the ſleep will continue for ſeveral days; being awaked, he will anſwer queſtions, but immediately fall aſleep again. When he recovers, he remembers nothing that he ſaid. If it happens in acute fevers, on critical days, with a ſweat, it is a good omen. The third happens a day or two before death: for, the patient's ſtrength being exhauſted, he lies deprived of ſenſe and motion, as it were in a profound ſleep, and under that expires.

A lethargy is a heavy and perpetual ſleep, with ſcarce any intervals of waking. It is attended with a ſtupidity, and ſo ſurpriſing a forgetfulneſs, that, when the patient yawns, he forgets to ſhut his mouth; or, if he takes the chamber-pot to make water, he forgets to do it, and falls aſleep.

A lethargy is attended with a fever, which is a ſymptom thereof, and is chiefly diſcovered by the frequency of the pulſe; whereas a carus is often a ſymptom or a conſequence of a fever, and is likewiſe attended with inſenſibility. It does not invade ſo ſuddenly as an apoplexy, which is attended with an abolition of all ſenſe and voluntary motion, and kills ſooner than a lethargy.

In the cure of theſe diſeaſes, three intentions ſhould chiefly be regarded; 1. To rouſe the patient from ſleep. 2. To remove the difficulty of circulation, and the ſtagnation or extravaſation of the blood or ſerum in the head. 3. To reſtore the ſtrength of the membranes and veſſels of the brain.

Thoſe remedies are efficacious in the firſt caſe, which act on the nervous parts, by inducing a tremulous and oſcillatory motion through the whole nervous ſyſtem: ſuch as powerful acids, mixed with tincture of caſtor; volatile ſalts; fetid things, as galbanum, burnt partridges feathers; cold water thrown on the head; cataplaſms made with vinegar, rue, bay-leaves, tops of ſavory, muſtard-ſeed, caſtor, and camphor, applied to the head, forehead, and temples.

The ſerous colluvies is derived from the head by ſternutatories; the beſt is ten grains of ſalt of white vitriol diſſolved in half an ounce of marjoram water, and drawn up the noſe; bliſters on the feet and neck; cupping-glaſſes, either with or without ſcarification; ſtrong frictions on the lower parts; ſtimulating clyſters, with the addition of *ſal. gem.* common ſalt, or the root of ſquills.

To remove the ſtagnation, and promote the circulation, if the veſſels are turgid with blood, venæſection is neceſſary; then gentle laxatives, and nervous medicines with diaphoretics. A powder made of ſalt of hartſhorn, ſalt of amber, cinnabar of antimony, and bezoar mineral, has very great and ſalutary effects.

A carus, eſpecially the firſt ſpecies of it, requires plentiful bleeding; and the patient muſt be roufed by clyſters, rendered ſtimulating with the powder of ſquills; by bliſters; by putting diſtilled vinegar in the noſtrils; and

and by appeaſing the orgaſm of the fluids with cooling fixed diaphoretics and acids. The ſecond ſpecies requires but little or no aſſiſtance; and the third is incurable, at leaſt if bliſters fail.

A coma ſomnolentum is divided into ſerous and ſanguine. The firſt requires the natural ſerous evacuations to be reſtored or promoted. Gouty fits are to be invited by frictions of the feet, bliſters, relaxing applications, and warm baths. Sternutatories are of great uſe, as they diſcharge the ſerum through the noſe, and ſtimulate the nerves. When a viſcid phlegm offends the ſtomach, vomits are uſeful, with half a ſcruple or a ſcruple of powder of ſquills, or ij gr. of emetic tartar, with a laxative potion.

In a ſanguine coma ſomnolentum, when the blood circulates ſlowly, or ſtagnates in the head, as in the hypochondriac or ſcorbutic, all hot ſpirituous remedies are as bad as poiſon: But bleeding, clyſters, gentle laxatives, cooling and nervous powders, are uſeful.

A red face, eyes turgid with blood, indicate bleeding. Warm baths are bad in all ſleepy diſorders; likewiſe ſaffron, poppies, and opiates of all kinds.

Of the CATALEPSY.

THE catalepſis is alſo called catochus, and catoche; and whoever is affected with it is in an inſtant rendered as immoveable as a ſtatue, without ſenſe, and without motion; and continues in the ſame poſture they were in at the moment they were ſeized.

The proximate cauſe of this diſeaſe is the immobility of the common ſenſory from the time of the firſt attack; therefore there is an abſolute reſt of the blood in the brain, of the glands of the brain, and of all its emiſſaries; whereby all the functions of the brain are injured, as well as thoſe that depend thereon: The muſcles only remain tenſe as in the beginning; the reſpiration and pulſe indeed continue, but they are very faint.

But Hoffman aſſerts, that the pulſe is natural, and the breathing free and eaſy; that the limbs are moveable, but remain in the ſame ſituation in which you place them. They neither hear nor ſee, though their eyes are open; nor feel, though they are pricked ever ſo much; yet, if you thruſt any thing into their mouths, they will ſwallow it: But their bodies are ſo bound, that you cannot thruſt the fineſt pipe into the anus. The colour of the face continues florid. At laſt they fetch deep ſighs, and come to themſelves, and tell wonderful things of what they have ſeen and heard during the paroxyſm; ſome declare they have enjoyed exquiſite pleaſures, or ſeen tragical ſights, or have had divine viſions, and the converſation of angels.

This diſeaſe is generally preceded by obſtinate intermitting fevers, eſpecially quartans; by a dry, melancholy, lean temperament of body; by a retenſion of the menſes, and hæmorrhoids; by great and ſudden frights; by a profound, conſtant, fixed meditation on one object, or by ſtrong fevers in perſons of a ſanguine conſtitution.

The method of cure is various, according to the different cauſes. The patient ſhould be excited with things that greatly ſtrike the ſenſes; ſuch as light, noiſe, ſtimulating things, volatile ſalts, pain, frictions, continual agitations; by cauſing an hæmorrhage of the noſe; by promoting the hæmorrhoidal or menſtrual flux; by ſternutatories and emetics; by bliſters; by iſſues; by ſetons; by a moiſtening diet.

Of the VERTIGO.

A vertigo, giddineſs, or ſwimming in the head, is a diſorder in which all viſible objects ſeem to turn round, attended with ſtaggering, or danger of falling.

A giddineſs, when it is not an original diſorder in the head, is cauſed by a long turning round of the body; by looking from a high place; in ſome, by paſſing over a broad river, by riding in a coach, by ſailing in a ſhip or boat, and by drunkenneſs.

A higher degree of a vertigo is a ſcotomia, when the patient is ſeized with a ſudden dimneſs or temporary deprivation of ſight. The higheſt degree of all is, when he falls down in the fit: This borders nearly on the epilepſy.

But it may be doubted whether a ſcotomia is always a ſymptom of a vertigo, properly ſo called; becauſe it often follows great hæmorrhages, long faſting, and very hard labour.

A vertigo will ſometimes ariſe by conſent, from diſorders of the ſtomach; and, as Etmuller obſerves, often merely from faſting, and then a morſel or two of bread will drive it away.

An invetesate vertigo, beginning without any manifeſt external cauſe, foretells in young men an epilepſy, in old men an apoplexy.

The vertigo often ariſes from a congeſtion of blood in the head, when the patient is plethoric; or where any uſual evacuation of blood is ſuppreſſed, or from an omiſſion of bleeding when accuſtomed thereto. It affects ſome whoſe heads are debilitated with hard ſtudy, or whoſe ſtomachs are loaded with vitiated, eſpecially bilious, humours.

In plethoric caſes, laxatives, bleeding in the foot, pediluvia, reſolving attemperating powders, cinnabar, nitre with an infuſion of tea or betony, are proper. If from a ſuppreſſion of an uſual hæmorrhage, it is to be promoted; but, if this cannot be done, bleeding muſt be ſubſtituted.

Outwardly, camphorated ſpirit of wine alone, or mixed with ſpirit of hartſhorn, applied to the top of the head and temples, will be uſeful; or Hungary-water, or volatile ſalts, or ſpirit of lavender, may be held to the noſe. The ſame things are good when it proceeds from hard ſtudy, with moderate diet and frequent exerciſe. As alſo a glaſs or two of wine at meals, and other ſtrengtheners. But becauſe many learned men have been hurt by the external uſe of volatile and fragrant ſpirits as well as apoplectic balſams, theſe are to be tried with great caution.

If a vertigo proceeds from crudities in the ſtomach, they ſhould be prepared or diſſolved by neutral ſalts, ſuch as tartar vitriolate; and then they ſhould be evacuated by an emetic; but, if any thing forbids, by a purge. Afterwards give ſtomachics and cephalics, and adviſe a moderate uſe of wine at meals, a ſparing aromatic diet, and exerciſe of the body. Pyrmont water is excellent in this caſe.

Of the HYSTERIC PASSION.

THE hyſteric paſſion is a ſpaſmodico-convulſive affection of the nervous ſyſtem proceeding from the womb, and cauſed

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cauſed by the retention or corruption of the blood and lymph in its veſſels; and more or leſs infeſting the nervous parts of the whole body, by means of the nerves of the os ſacrum, the loins, and the whole ſpinal marrow.

This diſeaſe has been very improperly confounded with the hypochondriac paſſion; for a ſtrangulation of the fauces, an intercepted breathing even to ſuffocation, a fainting away, a loſs of voice, a profound ſleep, are the true, proper, and eſſential ſigns and ſymptoms of this uterine diſeaſe.

An hyſteric fit is generally preceded with a preſſing pain in the forehead, temples, or eyes, with an effuſion of tears and dimneſs of ſight, a dulneſs of the mind and ſenſes, and a loathing of all things. When the fit comes on, the patient is exceeding coſtive, and yet has a ſtrong ſtimulus to diſcharge her urine, which is as clear as water; the breathing is uneaſy, difficult, and ſhort; and a langour ſeizes the whole body. To theſe ſucceed a pain in the loins, and a great ſhivering and ſhaking; the belly is hard and inflated; afterwards the navel is drawn inwards, and outwardly leaves a great pit; then they feel a ſort of a globe ariſe from the lower part of the belly to the hypochondria and diaphragm. Soon after, the heart begins to flutter and beat, with a hard, unequal and ſometimes intermitting pulſe; the extreme parts grow cold; the fauces are ſtraitened, and ſeem to be bound with a cord; the face is pale, the breathing exceeding difficult, the voice ceaſes, the pulſe is almoſt imperceptible; and there is ſuch a ſtricture of the belly, that no flatus can be emitted, nor no clyſter given. In ſome there are convulſions of the head and limbs; others lie in a profound ſleep, without ſenſe or motion; others have their face and neck look red and inflamed, with a ſtrong pulſe; and others again break out into immoderate laughter, and, regaining their voice, ſay a great many ſilly things.

When they begin to come to themſelves the pulſe, which was before weak, languid, and obſcure, becomes briſk, ſoft, and ſtrong; heat returns to the extreme parts; the face which was pinched in and pale, begins to expand and look ruddy; the wind forces its way upwards; there is a rumbling in the belly; and at length the patients, waking, as it were, out of a profound ſleep, have their voice, ſenſes, and motion reſtored. Yet they complain of a heavy pain in the head; a languor of the body, feet, and thighs; ſome have continued in a fit ſo long that they have been laid out for dead, and have been even buried.

The hyſteric paſſion attacks women that are pregnant, in child-bed; widows that are full of blood, after ſome grievous paſſion of the mind; or maids, after a ſudden ſuppreſſion of the menſtrual flux. It likewiſe oftentimes comes on ſo ſuddenly, violently, and at unawares, that being deprived of all ſenſe and motion, they immediately fall down.

This diſeaſe may be cauſed by whatever promotes a more plentiful and rapid afflux of blood and the genital fluid to the uterine parts, or impedes the eruption of the menſes, or occaſions their ſuppreſſion: hence maids and widows are moſt ſubject thereto; alſo women of a ſanguine or bilious conſtitution, who live high, drink generous wines, feed on high-ſeaſoned aliments and are ſubject to violent paſſions and commotions of the body and mind. On the other hand, thoſe who live a ſedentary life, feed on coarſe, acid, low diet, who have omitted uſual bleeding, who are oppreſſed with ſorrows, cares, and diſappointments, are liable to this diſeaſe; for by theſe the blood is thickened, the ſolid parts weakened, and conſequently the flowing of the menſes rendered more difficult. Likewiſe ſudden terror, and the body being expoſed to uncommon cold during the time of the menſtrual flux, by giving it a check procure hyſteric ſpaſms.

However dreadful and cruel this diſeaſe may appear, yet it is not very dangerous in itſelf, unleſs ill managed, or the patient be exceeding weak and valetudinary: it is moſt apt to turn into convulſions and an epilepſy. When it proceeds from abortion, or hard labour, it is very liable to return from any ſlight irritation of the nervous ſyſtem. Nor is it very uncommon for the hypochondriac and hyſteric diſorders to be united, and then the cure is very difficult. This happens to women who lead a ſedentary life, indulge extravagant affections of the mind, and are guilty of errors in diet and regimen.

In the cure, it muſt be carefully obſerved whether the woman is plethoric, or exhauſted of blood and ſtrength. In the former caſe, the ſpaſms or convulſions are more violent, and copious bleeding is a preſent help; and many have been brought to themſelves who were ſeemingly dead, if the florid colour of their faces had not ſhewn the contrary.

In the fit, it will be proper to apply fetid things to the noſe; ſuch as *aſa-fœtida*, preparations of caſtor, partridges feathers burnt, *&c.* For women in childbed, a girdle made of Ruſſia leather, and bound pretty tight, is excellent. Likewiſe clyſters made with roots and ſeeds of lovage, which are ſpecifics, camomile flowers, elder-flowers, veronica, the carminative ſeeds boiled; to which may be added oil of elder, dill, or camomile.

Externally, plaſters made of opoponax, bdellium, galbanum, ſagapenum, and aſa-fetida, may be applied to the navel; or,

Some greatly commend fumigations for the uterus of muſk, civet, ſtorax, and benjamin.

Inwardly, the patient may take 30 or 40 drops of tincture of caſtor in cold water.

Some hyſterical diſorders obſerve the lunar phaſes, and partake of the nature of an epilepſy: They ſeldom require bleeding, and purging ſhould be uſed with caution: Emetics are of greater ſervice, eſpecially a little before the fit. In the fit, the beſt medicines are thoſe which repair the loſs of ſpirits, as Ruſſian caſtor, gum-ammoniac, ſalt of amber in pills.

Out of the fit, native cinnabar and wild valerian root are moſt proper for correcting the juices.

To prevent its degenerating into a chronic diſeaſe, particularly the hypochondriac paſſion, care muſt be taken to keep the menſes regular; which muſt be done by balſamics, compoſed of myrrh and amber, with bitter and carminative extracts, eſpecially zedoary and orange peel, made into an elixir, with a moderately ſpirituous menſtruum. This, frequently taken, helps the digeſtion, and promotes a regular menſtrual diſcharge.

But it is neceſſary to obſerve, that in hyſteric caſes remedies have a different effect on different women. Some cannot bear fetid medicines, which to others are an immediate

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mediate relief. Some have fallen into a terrible ſyncope, and have come to themſelves by ſprinkling cold water on the face, when more powerful and ſpirituous things have failed. Others cannot endure hot things inwardly nor outwardly, as baths, fomentations, liniments, and nervous applications. Anodynes and opiates, which procure eaſe and reſt to ſome, are very injurious to others who are greatly debilitated, and whoſe nerves are weak. Some have recovered from a violent paroxyſm, by a draught of cold water; which, given to others, has increaſed the diſorder.

Peruvian bark given morning and evening, a ſcruple at a time, is an excellent remedy in hyſteric convulſions.

Of the Hypochondriac Paſſion.

The hypochondriac paſſion is a ſpaſmodico-flatulent affection of the ſtomach and inteſtines, ariſing from an inverſion or perverſion of their periſtaltic motion, and by a conſent of parts, throwing the whole nervous ſyſtem into irregular motions, and diſturbing the whole animal oeconomy.

This diſeaſe is attended with ſuch a train of ſymptoms, that it is a difficult taſk to enumerate them all; for there is no function or part of the body, that is not ſoon or late a ſufferer by its tyranny. It begins with tenſions and windy inflations of the ſtomach and inteſtines, eſpecially under the ſpurious ribs of the left hypochondrium, in which a pretty hard tumour may ſometimes be perceived.

With regard to the ſtomach, there is a naufea, a loathing of food, an uncertain appetite, ſometimes quite decayed, and ſometimes ſtrong; the aliments are ill digeſted, breeding acid and viſcid crudities; there is a preſſing, heavy pain in the ſtomach, chiefly after meals; a ſpaſmodic conſtriction of the gullet, a frequent ſpitting of limpid phlegm, an impediment of ſwallowing, a violent heart-burn, a heat at the ſtomach, very acid belchings, a reaching to vomit, vomiting, bringing up ſuch acid ſtuff, that the teeth are not only ſet on edge thereby, but the very linen or ſheets are ſometimes corroded.

In the volume of the inteſtines, eſpecially the ſmall ones about the navel, there are felt heavy excruciating pains, wringings, grippings, with a rumbling murmuring noiſe; in the groſs inteſtines the pains are more acute. Sometimes there is a looſeneſs, ſometimes a moſt obſtinate coſtiveneſs, with a retention of the wind; which, when it breaks out either upwards or downwards, is attended with an alleviation of the ſymptoms, but they ſoon rage again with as great violence as ever. When there is a frequent urging to go to ſtool, tubercles generally ariſe, and the blind piles beſet the anus; nay, ſometimes a ſymptomatical flux of blood will burſt out. Making water in ſome is difficult and painful; the urine is thin, limpid, and pale; ſometimes it has a copious ſediment mixt with fabulous concretions, and often reſembles a fit of the gravel.

In the breaſt there is a great ſtraitneſs, conſtriction, exceſſive difficulty of breathing, ſometimes with a ſenſe of fulneſs, a fluttering and palpitation of the heart.

As the diſeaſe increaſes, the head is moleſted with an head-ach, hemicranium, various fixed ſpaſtic pains, and what is commonly called the clavus hyſtericus. A noiſe in the ears, with difficulty of hearing; the eyes are clouded with a ſcotamia; ſome have double viſion, or a pain and dryneſs of the eyes. In the tongue there is a moſt troubleſome burning pain fixed to a certain ſpace, with a plentiful excretion of ſpittle, as if the patient was in a ſalivation.

At length the animal functions are impaired; the mind is diſturbed on the moſt trivial occaſions, and is hurried into the moſt perverſe commotions, inquietudes, anxieties, terror, ſadneſs, anger, fear, or diffidence. The patient is prone to entertain wild imaginations and extravagant fancies; the memory grows weak, and the reaſon fails.

Perſons are moſt liable to this diſeaſe from twenty to fifty, and whoſe ſolids are ſoft, lax, and flabby, and their blood-veſſels ſmall; as alſo who are naturally languid, or have been weakened by tedious maladies. Likewiſe thoſe who lead ſedentary lives, and ſtudy too hard; inſomuch that this is the peculiar diſeaſe of the learned.

The remote cauſes of theſe diſorders are the ſuppreſſion of the hæmorrhoids and menſes, and other periodical fluxes of blood; an hereditary diſpoſition thereto; a cold and moiſt conſtitution of the air; groſs, impure, flatulent diet; a ſedentary, ſtudious life; ſadneſs, cares, troubles, intenſe thinking on a ſingle object; tedious diſeaſes not rightly treated; hard labour in child-bearing.

As to the prognoſtics, if the diſeaſe be recent and left to itſelf, it is rather troubleſome than dangerous; but if it be inveterate, and not ſkilfully treated, or a bad regimen is followed, it is attended with more grievous ſymptoms, producing obſtructions and ſchirri of the viſcera, a cachexy, a dropſy, an hectic, a convulſive aſthma, an incurable melancholy or madneſs, a fatal polypus, *&c.* But if it is cauſed by a ſuppreſſion of the menſes, or bleeding piles, the reſtoring the flux is the cure of the diſeaſe.

As continual fear and diffidence are ſymptoms of this diſeaſe, the patients are always foreboding terrible things, and live in conſtant dread of death; which render them fickle, impatient, and prone to run from one phyſician to another. Therefore, when a cure is attempted, they muſt be admoniſhed to be conſtant and patient; and then the following indications may be purſued: 1. To correct and evacuate the acid, viſcid, bilious filth, and flatulent ſordes from the primæ viæ, which yield continual fewel to this diſeaſe. 2. The ſpaſms being appeaſed, to reſtore the natural order of the periſtaltic motion of the inteſtines, and to recover it from a languid ſtate, that there may be a due concoction of the aliment, and a laudable chyle and other fluids generated. 3. To diſperſe the ſtagnated juices; to render the circulation of the blood equable through the abdomen and the reſt of the body; and to free the fluids from all acrimony, after facilitating the excretions by urine and through the ſkin. 4. And laſtly, to corroborate the whole nervous ſyſtem.

To anſwer the firſt intention, nothing is better in the fit than clyſters made with emollient herbs, water-gruel ſtrained, camomile-flowers, the tops of yarrow, the oils of ſweet-almonds, dill, camomile, linſeed, *&c.* adding a carminative ſpecies made of caraway, dill, but more eſpecially cumin ſeeds. Theſe ſhould be repeated, if the ſpaſms render them ineffectual. If the fæces are harden-

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ed, it will be proper to give oil of ſweet almonds and water gruel inwardly. Nor muſt gentle laxatives of manna, rhubarb, and cream of tartar, be neglected, with a few drops of oil of juniper.

If there is a great deal of acid filth in the ſtomach, crabs eyes alone will purge.

To corrrect the ſordes in the *primæ viæ*, give the abſorbent, precipitating, and antiſpaſmodic powers, ſuch as crab's-eyes, mother of pearl, pulvis marchionis, purified nitre, prepared amber, cinnabar, tartar-vitriolate, with a little caſtor. It will alſo be proper to take a decoction of any of the following things in the morning in bed, to promote a diaphoreſis, *viz.* balm veronica, betony, agrimony, ſcordium, carduus benedictus, tops of yarrow, daiſy flowers, camomile flowers, fennel ſeed, *&c.*

To reſtore the digeſtive power of the ſtomach, give eſſence of orange-peel, tincture of tartar, dulcified ſpirit of nitre, *&c.*

The paroxyſms are relieved by tepid pediluvia, made of wheat, bran, water, and camomile flowers. The feet muſt be put pretty deep therein.

Out of the fit, to diſcuſs the ſtagnation of the blood, bleeding in the foot will be neceſſary, eſpecially at the equinoxes, and at other times as occaſion ſhall require; but this ſhould be after laxatives and pediluvia. If there is a diſpoſition to an hæmorrhoidal flux, leeches ſhould be applied every month to the anus; and the patient ſhould alſo take balſamic pills, with antiſpaſmodic nitrous powders.

To ſtrengthen the nervous ſyſtem, nothing is better than chalybeates; for they, by a gentle aſtriction, reſtore the nerves to their former ſtrength. Outwardly a ſaponaceous plaſter, with camphor, may be laid to the hypochondria with no ſmall advantage.

Nothing is more friendly, nor gives greater energy to the blood and ſpirits, than riding on horſeback almoſt every day, and for a conſiderable time together. Nor does riding in a coach want its ſhare of ſalutary effects.

Of Melancholy *and* Madness.

Melancholy and madneſs may be very properly conſidered as diſeaſes nearly allied; for we find they have both the ſame origin; that is, an exceſſive congeſtion of blood in the brain: they only differ in degree, and with regard to the time of invaſion. Melancholy may be looked upon as the primary diſeaſe, of which madneſs is only the augmentation.

When perſons begin to be melancholy, they are ſad, dejected, and dull, without any apparent cauſe; they tremble for fear, are deſtitute of courage, ſubject to watching, and fond of ſolitude; they are fretful, fickle, captious, and inquiſitive; ſometimes niggardly to an exceſs, and ſometimes fooliſhly profuſe and prodigal. They are generally coſtive; and when they diſcharge their excrements, they are often dry, round, and covered with a black, bilious humour. Their urine is little, acrid, and bilious; they are troubled with flatulencies, putrid and fetid eructations. Sometimes they vomit an acrid humour with bile. Their countenances become pale and wan; they are lazy and weak, and yet devour their victuals with greedineſs.

Thoſe who are actually mad, are in an exceſſive rage when provoked to anger. Some wander about; ſome make a hideous noiſe; others ſhun the ſight of mankind; others, if permitted, would tear themſelves to pieces. Some, in the higheſt degree of the diſorder, ſee red images before their eyes, and fancy themſelves ſtruck with lightning. They are ſo ſalacious, that they have no ſenſe of ſhame in their venereal attempts. When the diſeaſe declines, they become ſtupid, ſedate, and mournful, and ſenſibly affected with their unhappy ſituation.

The antecedent ſigns are, a redneſs and ſuffuſion of the eyes with blood; a tremulous and inconſtant vibration of the eye-lids; a change of diſpoſition and behaviour; ſupercilious looks, a haughty carriage, diſdainful expreſſions, a grinding of the teeth, unaccountable malice to particular perſons; alſo little ſleep, a violent head-ach, quickneſs of hearing, a ſinging of the ears; to theſe may be added incredible ſtrength, inſenſibility of cold, and, in women, an accumulation of blood in the breaſts, in the increaſe of this diſorder.

Theſe things being duly conſidered, together with the ſtate of the brain in perſons who died of this diſeaſe, we may conclude, that melancholy is a ſtrong and lively working of the fancy, with a fixed attention of the mind to a particular object, which it continually dwells upon; together with a delirium, a long continual dejection, dread and ſadneſs without any manifeſt cauſe, ariſing from a difficult circulation of blood through the veſſels of the brain, where it is too copiouſly congeſted and becomes ſtagnant. Madneſs is a violent rage, attended with raſhneſs and preternatural ſtrength, cauſed by an impetuous motion of a thick melancholic blood through the veſſels of the brain. It differs from a phrenzy, which is a delirium accompanied with a fever, and ariſes from an inflammatory ſtagnation of the blood in the brain: for we learn from experience, that all the ſhining faculties of the mind are changed or depraved, diminiſhed or totally deſtroyed, when the blood and humours, receding from their natural temperament and due quantity, are not conveyed to the brain in a moderate and equable manner, but on the contrary with an impeded, ſlow, and languid motion, or with too briſk and violent an impetus.

Both theſe diſorders ſuppoſe a weakneſs of the brain, which may proceed from violent diſorders of the mind, eſpecially long continued grief, ſadneſs, dread, uneaſineſs and terror, as alſo cloſe ſtudy and intenſe application of mind, as well as long protracted lucubrations. It may alſo ariſe from violent love in either ſex, eſpecially if attended with deſpair; from profuſe evacuations of the ſemen; from an hereditary diſpoſition; from narcotic and ſtupefactic medicines; from previous diſeaſes, eſpecially acute fevers. Violent anger will change melancholy into madneſs; and exceſſive cold, eſpecially of the lower parts, will force the blood to the lungs, heart, and brain; whence oppreſſive anxieties, ſighs, and ſhortneſs of breathing, tremors and palpitations of the heart; thus vertigoes and a ſenſation of weight in the head, fierceneſs of the eyes, long watchings, various workings of the fancy intenſely fixed upon a ſingle object, are produced by theſe means. To theſe may be added a ſuppreſſion of uſual hæmorrhages, and omitting cuſtomary

bleeding: hence melancholy is a ſymptom very frequently attending hyſteric and hypochondriac diſorders.

The cauſes which contribute to the generation of a thick blood, are idleneſs and inactivity, which weaken the body, impair the functions, diminiſh the ſalutary excretions, and render the humours thick, viſcid, and ſtagnant: All which are heightened by ſolitude, which is apt to give riſe to various fantaſtic and gloomy ideas in the patient's mind.

Likewiſe acid humours in the ſtomach will increaſe the appetite, and tempt them to feed on coarſe, groſs, flatulent aliments, without drinking enough to dilute them ſufficiently, whence a matter proper to nouriſh theſe diſeaſes will proceed. It is evident from obſervation, that the blood of maniac patients is black, and hotter than in the natural ſtate; beſides, the ſerum ſeparates more ſlowly and in leſs quantity than in healthy perſons. The excrements are hard, of a dark-red or greyiſh colour, and the urine is light and thin.

Diſeaſes of the mind have ſomething in them ſo different from other diſorders, that they ſometimes remit for a long time, but return at certain periods, eſpecially about the ſolſtices, the times at which they firſt appeared. It may likewiſe be obſerved, that the raving fits of mad people, which keep the lunar period, are generally accompanied with epileptic ſymptoms.

This diſeaſe, when it is primary or idiophatic, is worſe than the ſymptomatic that accompanies the hyſteric or hypochondriac paſſion, which is eaſily cured; as is that alſo which ſucceeds intermitting fevers, a ſuppreſſion of the menſes, the lochia, the hæmorrhoids, or from narcotics. When the paroxyſms are ſlight in the idiophatic kind, the cure is not very difficult: but if it is inveterate, and has but ſhort remiſſions, it is almoſt incurable; which is often owing to this, that they reject phyſicians and their medicines as poiſon. It is a bad ſign, if, after a profound ſleep, the patient ſtill continues delirious, and is inſenſible of cold, or is unaffected with ſtrong draſtic medicines. If after want of ſleep and long abſtinence the patient is exceeding weak, or becomes epileptic, convulſive, or lethargic, death is not far off. Mad people are ſeldom ſubject to epidemic or other diſorders, and ſome have lived ſeventy years and upwards in this unhappy ſtate.

Sometimes this diſeaſe terminates by critical excretions of blood from the noſe, uterus, or anus. Sometimes diarrhœas and dyſenteries will terminate theſe diſorders. Puſtules, the itch, and ulcers, have alſo done the ſame.

In the cure, bleeding is the moſt efficacious of all remedies; and where there is a redundance of thick, grumous blood, a vein is firſt to be opened in the foot, and a few days after in the arm; then in the jugular vein, or in the noſtrils with a ſtraw; and, laſt of all, the frontal vein with a blunt lancet, for fear of hurting the pericranium, a ligature having been firſt made round the neck to render the veins tumid.

Tepid baths are alſo convenient, to drive the blood from the head to the inferior parts; and before the patient enters the bath he ſhould have cold water poured on his head, or it ſhould be covered with a cloth dipt therein; for cold water pumped or poured on the head conſtringes and corroborates the veſſels of the brain weakened with ſtagnant blood, and promotes the more eaſy diſcuſſion of the humours congeſted therein.

Purgatives are likewiſe uſeful; but the lenient are preferable to the draſtic: Thus manna, caſſia, rhubarb, cream of tartar, tartar-vitriolate, are moſt convenient when the diſeaſe ariſes from the hypochondriac paſſion, and a ſtagnation of the blood in the inteſtines, and the ramifications of the *vena portæ*; eſpecially when they are taken in decoctions and infuſions, not all at once, but at repeated intervals, ſo as to operate in an alterative manner.

Some kinds of mineral waters are alſo highly efficacious in melancholy and madneſs; for ſince madneſs generally derives its origin from the melancholy, and melancholy from the hypochondriac paſſion, and the hypochondriac paſſion from impure and peccant fluids ſlowly circulating through the inteſtines and viſcera of the abdomen, the circulation of the blood ought to be rendered free and eaſy. It is no wonder therefore that mineral waters have been held in high eſteem for the cure of theſe diſorders; for theſe being impregnated with a highly pure alkaline and neutral mineral ſalt, if they are drank in a due quantity, they not only change the peccant humours, but incide ſuch as are thick, render the glutinous fluid, and open the obſtructions of the veſſels; they alſo relax the tenſe fibres of the ſolids, and corroborate the weak and tender, as well as, by ſtimulating the emunctories, they reſtore all the ſalutary excretions. The waters of Selters mixed with aſſes or goats milk have not their equal in theſe caſes. They ſhould be drank in the ſpring and fall for five or ſix weeks. The proportion is one part milk to three of water.

But, after all, there is nothing better to remove the cauſe of theſe diſorders than depurated nitre, but eſpecially in that ſpecies of madneſs which inclines to melancholy; for it corrects the bilious acrimony of the humours, allays the tumultuous motions of the ſolids, by diminiſhing the preternatural heat. Sennertus and Riverius affirm, that nitre, given with a little camphor, is a ſpecific in madneſs

Particular medicines among vegetables are, balm, betony, vervain, brook-lime, ſage, wormwood, flowers of St John's wort, of the lime-tree and camphor: from animals, aſſes blood dried: among minerals, ſteel, cinnabar, ſugar of lead, and the calx and tincture of ſilver.

Camphor is much praiſed by the moderns, particularly by Etmuller.

And Dr Friewald affirms, that with a few doſes of camphor, of xvj grains each, in pills, he has cured ſeveral mad patients, even in inveterate caſes.

Stahl recommends a powder of the following cephalic and nervine herbs: vervain, ſage, betony, with plaintain and white maidenhair.

As to diet, the patient ſhould carefully abſtain from ſalt and ſmoak-dried fleſh, whether beef or pork; from ſhell fiſh; from fiſh of a heavy and noxious quality; from aliments prepared with onions and garlick, all which generate a thick blood. In general, he ſhould eat no more than is neceſſary to ſupport nature. Small-beer or pure cold water are the beſt drink. Sweet and ſtrong wines are highly prejudicial; as is alſo exceſſive ſmoaking tobacco,

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tobacco; for it not only penetrates thick blood, but throws the fluids into preternatural commotions. Change of air and travelling may be beneficial.

Though in deliriums bleeding is highly uſeful, yet it agrees beſt with thoſe that are plethoric, bilious, and in the vigour of youth: theſe likewiſe will bear frequent purges of corrected hellebore; but then the ſtrength muſt be repaired by cordial, corroborating, and anodyne ſedatives. When the patient is exhauſted, bleeding is hurtful, and reſtoratives good.

As a high degree of the itch has terminated theſe diſeaſes, it will be proper to make iſſues in the back, or to procure ulcers with a potential cautery near the ſpine of the back.

Sedative medicines are good; but not opiates and narcotics, for theſe induce ſtupidity and folly. Thoſe that are good in an epilepſy, will be beneficial here; ſuch as caſtor, ſhavings of hartſhorn, the roots and ſeeds of piony, and anti-epileptic powders, the valerian root, flowers of the lily of the valley and of the lime tree.

And to the other ſort of madneſs, which proceeds from being exhauſted and weakened by autumnal, violent, and obſtinate intermitting fevers, and from their being injudiciouſly treated with bleedings and purgings, it is only to be cured by reſtoratives, cordials, and corroboratives, long perſiſted in.

Of the HYDROPHOBIA.

THIS diſeaſe, as it generally proceeds from the bite of a dog, is called *rabies canina*, or the canine madneſs; and from its moſt terrible ſymptom, the dread of water, *hydrophobia*. It almoſt always ariſes from the infection communicated by the bite of a mad animal: yet it has been obſerved to ariſe ſpontaneouſly in ſome animals affected with acute diſeaſes.

Almoſt all kinds of animals may be afflicted with this diſorder, and may infect other animals, and even men; as dogs, cats, wolves, foxes, horſes, aſſes, mules, horned cattle, hogs, monkeys, and cocks; but it moſt frequently attacks the dogs, wolves, and foxes, without any previous contagion.

A hot climate, exceſſive heats and ſudden colds; a long and dry ſeaſon; feeding upon putrid, ſtinking, verminous fleſh; want of water; worms generated in the kidneys, guts, brain, or noſtrils; are the preceding cauſes of madneſs in theſe animals.

When they are going to run mad, they appear dejected, ſhun company and hide themſelves; they will not bark, but ſeem to mutter or murmur, and are averſe to food and water; they will fly upon ſtrangers, but retain ſome regard for their maſter; their ears and tails hang down, and they walk along as if they were ſleepy. This is the firſt degree of the diſeaſe; and, though the bite is then bad, it is not at the worſt. Afterwards they begin to pant, hang out their tongues, froth at the mouth, and gape. Sometimes they ſeem dull and half aſleep; ſometimes they will run, but not directly forward, and ſoon ceaſe to know their maſters. Their eyes are dejected, look watery and duſty, their tongues are of a lead colour, they fall away ſuddenly, and grow raging mad. A bite at this time is incurable; and the nearer they are to death, with the more dreadful ſymptoms it is attended.

There is ſcarce any poiſon infectious ſo many ways as this: for it takes effect through the cloaths, without fetching blood; by the breath of the animal drawn into the lungs; by a touch of the froth, if recent; and by applying it to the lips or tongue, when it has been long dried; or by kiſſing a dog that is mad; or by handling the wound or inſtrument which was the death of the animal; or by handling things which have been infected by any of the former means.

Again, there is ſcarce any poiſon which produces ſuch terrible effects, and cauſes ſuch a wonderful change in the perſon infected. When it begins to work, it is moſt violent and quick; and yet, as it is ſaid, it will ſometimes lie dormant for years together before it exerts itſelf. This diverſity depends on the heat of the ſeaſon, the degree of the diſeaſe of the infected animal, and the temperament of the perſon bit. For the bilious are ſooneſt affected by it; the phlegmatic and hydropic the leaſt; likewiſe ſomething may be attributed to the way of living, diet, and medicines.

A healthy man, infected with this contagion, finds the effects of it diſcover themſelves in the following order. There is a pain in the place where he was bit, or received the contagion; and then wandering pains in the other parts, chiefly thoſe that are near it; a laſſitude, heavineſs, liſtleſſneſs of the whole body; inquiet troubled ſleep, and terrible dreams, with convulſions, and ſubſultus of the tendons; continual inquietude; ſighs, ſadneſs, love of ſolitude: This ends the firſt degree of the diſeaſe. Afterwards all the former ſymptoms increaſe, with a prodigious ſtraitneſs or oppreſſion about the præcordia; a difficult ſighing reſpiration; horror; a ſhaking and trembling at the ſight of any liquid, or bright, pellucid thing; loſs of appetite; a poſſibility of ſwallowing any thing ſolid; but, if any liquid is touched with the lips and tongue, it occaſions an incredible anxiety, trembling, and terrible convulſions, almoſt forcing the patient into a rage; then a vomiting of dark, bilious, viſcid matter, or porraceous bile; an increaſed heat, a fever, continual watching; a priapiſm; a confuſed ſeries of wild, extravagant thoughts: Here the ſecond degree of the diſeaſe may be ſaid to terminate. Now all the ſymptoms grow worſe and worſe: the tongue hangs out, and is rough; the mouth is wide open; the voice is hoarſe; the thirſt great; ſtrange horrors, ſtarting, and wild looks, at the ſight of water; a frothing at the mouth; an involuntary inclination to ſpit at the by-ſtanders, as alſo to bite them, which the patient cannot reſiſt. He foams at the mouth, and gnaſhes with his teeth; and would do miſchief, if not forcibly with-held. His pulſe and breathing fail: there is a cold ſweat, and the higheſt fury: yet during all this time, which is wonderful, the patient continues in his ſenſes, and is afraid of doing any harm. On the fourth day from the firſt degree of the diſeaſe, the patient falls into convulſions, with great difficulty of breathing; and then dies.

The diſſection of perſons who died of this diſeaſe has ſhewn, that the organs of ſwallowing have been in ſome meaſure inflamed: that various kinds of bilious viſcidities are collected in the ſtomach; that the gall-bladder is full

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of a black bile; that the pericardium is dry; that the lungs are incredibly diſtended with blood; that the heart is full of an almoſt dry blood; that the arteries are full, and the veins almoſt empty; that the blood is very fluid, and will hardly coagulate when expoſed to the air; whereas that which was drawn from a vein three days before, coagulated as uſual; that all the muſcles, viſcera, brain, cerebellum, and ſpinal marrow, are more dry than common.

The prevention and cure of this diſeaſe, except in a few inſtances, are very doubtful and uncertain: which may be attributed to the boaſting pretences of ſome to ſpecifics, and the neglect of a due method of cure, founded on the hiſtory of the diſorder.

So far therefore as may be conjectured from the preceding hiſtory of the diſorder, and from comparing it with other diſeaſes, as alſo from the few inſtances which have been attended with a happy event, it ſeems chiefly to conſiſt in an affection of the nerves, which moſt nearly reſembles convulſions, which occupy the viſcera and the veſſels thereof; whence ariſes a diſorder in the blood and humours, which is not unlike a gangrenous inflammation. The ſeat of the diſeaſe is chiefly about the ſtomach and the neighbouring parts.

The preventive cure conſiſts in making deep ſcarifications, as ſoon as poſſible after the bite, in the part affected, and thoſe adjacent to it; that they make a conſiderable diſcharge of blood, and apply large cupping-glaſſes thereon; or it may be burnt pretty deep with an actual cautery. Then it ſhould be made to ſuppurate by ſome corroſive application proper for that purpoſe; and during all that time it ſhould be continually fomented with a pickle made with vinegar and ſalt: this ſhould be continued for ſix months at leaſt. The garments he had on at the time of the bite ſhould be cautiouſly laid aſide or deſtroyed. He ſhould likewiſe with all convenient ſpeed be dipped in a river, or the ſea, making him believe that he is going to be drowned. This is to be often repeated; for the effect conſiſts in terrifying the mind, not in the ſalt-water, as we have learnt from experience. Then he ſhould alſo be often and ſtrongly purged with rhubarb, agaric, and the juice of elder-bark.

The patient ſhould alſo be put into a ſweat every morning faſting, with a mixture of aromatic vinegar, ſea-ſalt, and hot water. His feet and hands ſhould alſo be daily fomented in a warm bath; and he ſhould waſh his head, mouth, and fauces.

Let him often drink cold water, and throw it up again by vomiting; and let his drink be acidulated. His aliment ſhould be moiſt, light, and laxative, and often taken in ſuch a quantity as to vomit it up again. He ſhould likewiſe abſtain from things that are too ſpicy, from wine, from heating things, from violent exerciſe, and from commotions of the mind.

The cure ſhould be attempted when the diſeaſe is in the firſt degree, and in the beginning of the ſecond, by treating it as highly inflammatory, by letting blood from a large orifice even to a deliquium, by giving clyſters ſoon after with nitrous or moderately ſalt water.

After this let the patient be blind-folded, and thrown into a pond of cold water; or let cold water be thrown upon him till the dread of it almoſt ceaſes; then let a large quantity be forced down his throat: let this be his treatment daily, and at night let ſleep be procured. And this method is better than that pernicious one of giving him the moſt acrid heating and drying medicines; which exaſperate the nervous ſyſtem, and are in this caſe as bad as poiſon, to a patient already almoſt parched with heat.

Celſus informs us, that it was the practice of old to put the patient bit by a mad dog into a bath, and there to let him ſweat as long as his ſtrength will permit, at the ſame time keeping the wound open, that the virus might be diſcharged from it; and then to give him plenty of good generous wine This being done for three days, they judged him out of danger.

This may give ſome light into the nature of the pulvis antilyſſus publiſhed by Dr. Mead, and received into the diſpenſatory of the college, wherein pepper is one of the ingredients:

1. Take four drams of aſh-coloured ground liver-wort, and two drams of black pepper, beat into a powder.

This is to be divided into four doſes, whereof one to be taken in warm milk in a morning, faſting, for four mornings ſucceſſively. After this he is to be put into a cold bath, pond, or river, for thirty days together, early in the morning before breakfaſt.

Another famous ſpecific is the Eaſt-india medicine; which is doubtleſs an egregious antiſpaſmodic, and is as follows:

2. Take native and factitious cinnabar, of each 24 grains, and 16 grains of muſk. Make them into a powder.

This is to be taken in a tea-cup full of arrac or brandy, and is ſaid to ſecure the patient for thirty days, at the expiration of which it is to be repeated; but, if he has any ſymptoms of the diſeaſe, it muſt be repeated in three hours, which is ſaid to be ſufficient for a cure.

Dr. Wall of Worceſter has found two doſes of muſk, of xv grains each, to produce very happy effects on two perſons labouring under a ſubſultus tendinum, with extreme anxiety, and want of ſleep, from the bite of a mad dog; for it perfectly relieved them from their complaints. We have a ſingular caſe of a woman actually ſeized with an hydroprobia, given by Dr. Nugent; who was cured. He ordered this powder to be taken in honey every three hours, after ſhe had loſt 15 ounces of blood, and a pill of 2 grains of pure opium along with the powder, till reſt was procured.

Of POISONS.

THERE are three eſſential marks of poiſons which diſtinguiſh them from other things that are noxious to human bodies. The firſt is, that they conſiſt of moſt ſubtile parts, and conſequently are pernicious in a ſmall quantity. The ſecond, that they pervert, in a ſhort time, the regular motions of the ſolids and fluids throughout the body, and induce the moſt grievous ſymptoms, even death itſelf. And the third, that they exerciſe their cruelty on the moſt ſubtile fluid, and the moſt nervous parts.

All the three kingdoms have poiſons peculiar to themſelves; but the animal kingdom affords the moſt ſubtile, which are communicated by the the bite of mad or venom-

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ous beaſts when they are angered. The mineral kingdom produces arſenicals and mercurials; and the vegetable, herbs and plants, of a moſt acrid, noxious and deleterious quality, ſuch as the moſt violent cathartics and narcotics.

Every ſort of poiſon ſeems to have an effect peculiar to itſelf: thus mercury attacks the fauces and their glands, producing ulcerations therein; arſenic occaſions the moſt cruel torments, convulſions, and mortification of the coats of the inteſtines; the ſeeds of datura, a kind of ſtramonium, induce madneſs or abſolute ſtupidity; hyoſciamus cauſes a ſtupor, and ſo troubles the imagination, that the perſon affected believes he ſees dæmons and ſpectres. Opium brings on ſleepineſs, and a torpor on the mind. Sharp, draſtic purges inflame the inteſtines. The bite of a mad dog occaſions the dread of water. The ſting of a ſcorpion produces a ſudden and exceeding cold ſweat. Litharge, unwarily taken, cauſes a convulſive colic, with an obſtinate coſtiveneſs. The berries of dead ly night ſhade produce madneſs, rage, or folly; as do alſo the roots of cicuta terreſtris.

The bites of mad animals have been already treated of: and, as for others, it appears from experience, that the bites or ſtings of other animals, ſuch as ſpiders, ſcorpions, and vipers, are moſt pernicious in hot countries; and neither the inſects, nor any other animals, are poiſonous of themſelves, but their ſtings or bites, when they are mad, or provoked to anger.

The venom of animals, whether in a rage or madneſs, communicates an infection by the ſaliva, milk, and lympha.

The ſymptoms which follow the bite of a viper, are a ſharp, pricking pain in the wounded part; a tumour, which is firſt red, and afterwards livid, ſenſibly extending itſelf to the neighbouring parts: the ſkin frets, and breaks out into little bladders: ſome time after, a remarkable faintneſs ſupervenes, with a quick, weak, and ſometimes an intermitting pulſe, a palpitation of the heart, a ſtupefaction of the ſenſes, an anxiety of the præcordia, a great ſickneſs of the ſtomach with bilious vomitting, a dulneſs of ſight, ſometimes pains about the navel or the region of the liver, difficult breathing, hiccups, tremblings, convulſions, cold ſweats, coldneſs of the extremities; after which, death cloſes the ſcene, unleſs prevented by timely remedies. If the patient ſurvives, a tumour with inflammation continues for ſome time. Sometimes a ſanies flows from the wound, and puſtules appear, like the herpes exedens; the ſkin becomes yellow, as if the patient had the jaundice.

Hoffman obſerves, that externally in all venomous bites it will be proper to apply ſuch things as relax and mollify the ſtrictures of the parts, that open the pores, and ſo procure an exit for the virulent matter.

Boyle obſerves, that a hot iron held over the wounded part, immediately after the bite, ſo checks and weakens the venom, that the patient will have nothing to complain of but a pain in the part of ſhort continuance.

But, above all, Mead, from many experiments, recommends the fat of vipers, which, being rubbed into the wounded part, renders all others uſeleſs; and, if that is not at hand, it appears from ſome late trials, that common ſallad-oil, rubbed warm into the part, will do as well.

The bite of a RATTLE-SNAKE, hitherto looked upon as a moſt terrible accident, may now be cured in a ſimple, eaſy manner. It is the invention of a negro; for the diſcovery of which, he had his freedom purchaſed, and an hundred pounds per annum ſettled upon him during his life by the general aſſembly of Carolina.

Take of the roots of plantane and horehound (in the ſummer the roots and branches together) a ſufficient quantity; bruiſe them in a mortar, and ſqueeze out the juice, of which give as ſoon as poſſible one large ſpoonful; if the patient be ſwelled, you muſt force it down his throat. This generally will cure; but, if he finds no relief in an hour after, you may give another ſpoonful, which never fails.

If the roots are dried, they muſt be moiſtened with a little water. To the wound may be applied a leaf of good tobacco moiſtened with rum.

The mineral kingdom furniſhes very few real poiſons: the only natural one is cobalt; the factitious are arſenic, corroſive ſublimate, and glaſs of antimony.

Cobalt is a kind of a marcaſite, which is found in great plenty in the mines of Miſnia; and is well known for its poiſonous quality, ſo fatal to inſects, brutes, and men. In making the blue glaſs, or enamel, called ſmalt, from this mineral, a ſort of white flowers ariſes, which, being melted in a ſtronger fire, is called white arſenic. If this be melted again with an eleventh part of ſulphur, it becomes yellow arſenic, and, with a ſixth part of ſulphur, red. Of theſe, the white is the moſt deadly poiſon.

As for the true mineral poiſons, they were entirely unknown to the ancients; for they reckoned quickſilver, crude antimony, all kinds of vitriol as well as ceruſs, and the lapis lazuli, in that claſs; but orpiment, which they called arſenick, as Celſus teſtifies, and looked upon as a poiſon, is void of all virulence and deleterious qualities; and ſandarach they termed red arſenic, which is made of melted orpiment, but is no more noxious than the former. Indeed, it muſt be owned, that the above catalogue are not altogether friendly to human nature, or may be endued with a corroding quality; but they want the true characteriſtic of poiſons.

Quickſilver, diſſolved in acid mineral ſpirits, is likewiſe a poiſon, though of itſelf it is entirely innocent. This has chiefly appeared from errors in practice, when the mercury has not been rightly prepared and corrected.

Likewiſe glaſs of antimony reduced into powder, and exhibited, cauſes enormous vomiting, with moſt cruel gripings, which often end in death

Arſenic, taken inwardly, creates a pricking, vellicating, irritating, burning ſenſation, with a heat and moſt violent pain in the ſtomach, a racking torture in the bowels, vomiting, unquenchable thirſt, a roughneſs and dryneſs of the tongue, fauces and gullet, with hiccups: then follow moſt cruel anxieties, palpitation of the heart; fainting, coldneſs of the extremities; ſometimes black vomits, and ſtools with a fetid cadaverous ſmell; a gangrene and mortification of the ſtomach and inteſtines, which uſher in death.

Milk is very uſeful againſt all corroſive poiſons, by its ſoft, oleous contexture, blunting their acrimony; and is a good vehicle to bring them up by vomit.

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In all caſes where a perſon is ſuſpected to have been poiſoned by ſwallowing any ſubſtance of a corroſive nature, oil with milk for a vehicle yields the moſt certain relief; and even when acid mineral ſpirits are taken by miſtake, they will blunt or ſheathe the acrimony ſooner than fixed ſalts and teſtaceous powder will change their nature: beſides, ſallad-oil is generally at hand in all places as well as milk; and the ſooner it is given, the leſs is the danger.

The moſt dangerous vegetable poiſons, are wolf's-bane, the deadly night-ſhade, henbane, and datura; to which may be added the roots of oenanthe cicutæ facie, or hemlock-dropwort, cicuta vulgaris or common hemlock.

Hoffman affirms, that milk in a large quantity is an univerſal remedy againſt all poiſons that kill by inflammation, and if taken in time will prevent the direful conſequences. Allen thinks a vomit with warm water and oil, taken in large draughts and often repeated, will be of great ſervice; as alſo warm water with freſh butter, milk and oil, or milk and butter. If the above things will not provoke the patient to vomit, oxymel of ſquills, ſalt of vitriol, or a decoction of tobacco, may be uſed, as having a more immediate effect. It is hardly ſafe to give even the moſt gentle cathartic.

The ſtomach being thus emptied of all, or as much as poſſible, recourſe muſt be had to generous wine and alexipharmics, ſuch as venice-treacle, confectio alkermes, the bezoardic powder, *&c.* When there is a ſuſpicion that the coats of the ſtomach or inteſtines are corroded or ulcerated, it will not be proper for the patient to uſe ſpices or vinegar, nor to indulge in too much wine, but to take a decoction of barley with raiſins, or a decoction of china-root, ſaſſafras, *&c.*

The ſame method is moſt likely to anſwer when any other deleterious herb or root has been eaten by miſtake, though the particular ſpecies ſhould not be known; and Hoffman affirms, that when the patient has been ſtupified by the narcotics, the beſt remedies are vomits mixed with oil, to facilitate the operation.

Of a GUTTA SERENA.

A GUTTA ſerena, or amauroſis, is an abolition of the ſight, when no fault appears in the eyes, except in the pupil which is larger than uſual and more black, nor will it contract, though any luminous object is placed directly before it, but continues quite immoveable. It may be diſtinguiſhed from the diſorder of the eyes proceeding from the vertigo; for the objects ſeem to turn round: From a cataract; for then an opacity of the cryſtalline humour is perceivable, and the pupil will contract in a glaring light.

When this diſeaſe comes on ſuddenly, it generally proceeds from external cauſes, as blows, falls, and the like. When it comes on by degrees in old perſons, it ariſes from a hemiplexy or palſy; as alſo in other weak and languid conſtitutions. Sometimes its concomitants are pains in the head, the vertigo, ſleepineſs, noiſe in the ears, and ſometimes it comes on without any preceding ſymptoms.

From diſſections it has appeared, that the optic nerves have been in fault; that is, they are waſted away or much leſs than common; as alſo compreſſed by extravaſated fluids, or hard tumours about their origin.

The indications of cure are, to diſcuſs the ſtagnating humours, which compreſs the nerves, and then to ſtrengthen the affected parts.

Heiſter affirms, it is to be cured by aromatics, carminatives, and attenuants; chiefly eye-bright, veronica, hyſſop, roſemary-flowers, ſage, fennel, and aniſeeds, valerian root, ſaſſafras, cinnamon, wood-lice, either in infuſion or powder: the juice of wood-lice newly expreſſed, and taken for ſome weeks, increaſing the doſe, is of excellent uſe; as likewiſe mercurials, taken in very ſmall doſes, and a long while together.

If it ariſes from a ſuppreſſion of uſual hæmorrhages, they are to be reſtored; but, if this cannot be done, artificial bleeding is to be ſubſtituted.

Externally, iſſues are held to be good, clyſters and ſetons, eſpecially in the phlegmatic. The eyes may be waſhed with fennel, valerian, eye-bright, or roſe-water, ſpirit of wine, Hungary water, and ſal-volatile oleoſum diluted, or an infuſion of fennel-roots in wine, with bags of ſtrengthening herbs and fennel-ſeeds often put thereon. Sneezing powders may likewiſe be proper, eſpecially florentine orrice, or horſe cheſnuts; likewiſe ſpirits of hartſhorn, or ſal-volatile oleoſum, may be applied to the noſe.

In all diſorders of the eyes, but particularly in this, the body muſt always be kept open, that the humours may be invited downwards, with laxative pills mixed with calomel. Likewiſe ſtrong clyſters are of very great uſe.

Of a SUFFUSION, *or* CATARACT.

A SUFFUSION, or cataract, is an obſtruction of the pupil, by the interpoſition of ſome opaque ſubſtance, which diminiſhes or extinguiſhes the ſight: Some are thicker than others; ſome are white, black, citron-coloured, or browniſh. It is always contained between the uvea and ſclerotica, where it ſometimes ſwims and fluctuates like a bit of lawn in the aqueous humour, and ſometimes it adheres cloſe to the coats. It is generally an opacity of the cryſtalline humour.

The medicines above-mentioned, in an incipient or recent cataract, from thick or viſcid humours, may do good, eſpecially if they ariſe in the cryſtalline humour, as Heiſter affirms, becauſe they attenuate, reſolve, and render the humours fluxile, and increaſe the ſpirits. A grain or two of mercurius dulcis, given with twice the quantity of prepared oiſter-ſhells for thirty days together, has deſtroyed the rudiments of a cataract. But, if theſe have no effect, and the cataract grows inveterate, ripe, or perfect, it is to be depreſſed; for which, ſee SURGERY.

Of a GLAUCOMA.

A GLAUCOMA is a change of the cryſtalline humour into an azure colour, from its dryneſs and condenſation, as ſome affirm: but Heiſter ſays, it ariſes from an opacity of the vitreous humour, which becomes of a whitiſh green colour; for, in a ſuffuſion, an opaque body is placed behind the pupil, or is next to the uveous part.

Sennertus ſays, this malady is known from a very remarkable whiteneſs appearing in the eye, and lying deep behind the pupil, and all things are ſeen as through a ſmoke or cloud; it is ſaid to be incurable.

Of

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Of the Amblyopia, *or* Obſcurity of Sight.

The amblyopia is an obſcurity of ſight, and is fourfold: myopia, or ſhort-ſightedneſs; preſbytopia, or ſeeing only at too great a diſtance; nyctalopia, or ſeeing only in the night; amauroſis, of which before.

Myopia proceeds from the too great convexity of the cornea, or cryſtalline homour, or from the eyes being larger than common, as we learn from optics. This is beſt aſſiſted by concave glaſſes.

Preſbytopia proceeds from the contrary cauſes, and receives aſſiſtance from glaſſes of a convex form.

Nyctalopia is a twofold malady, in which the complaints are contrary to each other. In the firſt ſpecies, the ſight is beſt in the night, and in obſcure places; but in a clear light the ſight fails, and they can hardly ſee any thing at all. In the other ſort, which is improperly called a nyctalopia, they ſee nothing at all, except in a clear and bright light. This infirmity ariſes from a naturally bad formation of the eye, and is therefore incurable. The preſbytopia may likewiſe be aſſiſted by cephalic and ſtrengthening medicines, by watery and vinous infuſions, and comforting eye-waters.

Of a Strabismus, *or* Squinting.

A Strabismus, commonly called ſquinting, is an unequal contraction of the muſcles of the eye, either from a ſpaſm, an epilepſy, or a palſy, whereby the axis of the pupil is drawn towards the noſe, temples, forehead, or cheeks; ſo that the perſon cannot behold an object directly. Infants readily contract this diſtemper, ſometimes for want of care in the nurſes, who place the cradles in a wrong poſition, with regard to the light. Children likewiſe, while growing up, ſometimes fall into this diſorder, either from ill cuſtoms contracted in playing, or by looking on others who are affected with it.

This diſorder is very difficult to cure; therefore the utmoſt care ſhould be taken to prevent it, and the cradle ſhould be ſo placed, as not to occaſion the child to look a-wry. Ægineta contrived a maſk, and ſo adapted it to the face, that nothing could be ſeen except through two holes ſtraight forward; and for the ſame purpoſe what we call gogglers are uſed.

Of the Albugo, *or* Spot *in the* Eye.

An Albugo, or leucoma, is a whitiſh ſpot of the tranſparent cornea; the broader and thicker it is, the more it obſcures the ſight; when it is ſuperficial, it appears the whiter; and, when it is deeply rooted, it tends to blackneſs, and is ſcarce curable. That which is in reality a cicatrix, or ſcar, left after a wound or ulcer in the eye, is very difficult to be diſſipated; that which follows an inflammation of the eye often goes away of its own accord.

It may be diſtinguiſhed from a cicatrix, becauſe this is of a ſhining white and without pain; whereas the albugo looks like chalk, is attended with a ſlight fluxion, and ſome degree of an inflammation with pain. It is generally the forerunner of an ulcer.

The intentions of cure are anſwered by emollients, reſolvents, and diſcutients, which muſt be uſed with great caution. To take away a cicatrix, the ſharpeſt topics, nay, cathæretics, are ſometimes to be uſed, with a very prudent hand: but, firſt of all, mild things may be tried; and, if they fail, we may proceed to ſtronger.

Of a Sugillation, *or* Bloodſhot Eye.

A Sugillation firſt appears of a reddiſh colour, and afterwards livid or black. It is cauſed by a ſtroke or fall, or violent vomiting, whereby the blood is extravaſated in the coats of the eye. If the cornea is affected very much, all objects appear of a reddiſh colour; for ſome veins run to the cornea, in the part towards the iris, or the blood may be poured out into it from the neighbouring veſſels.

If the diſorder is great, there will be occaſion for bleeding and purging, for the grumated blood in the ſugillation is to be reſolved and diſcuſſed, which may be done by diſcutients, ſuch as juice of fennel, with balſam of Peru, juice of celandine, ſimple honey-water, mixed with other eye-waters.

If from this or any other cauſe there ſhould happen to be an ulcer of the eye, Demours recommends coarſe ſugar as a good ingredient for deterging thoſe of the cornea, in which aſtringents are hurtful; but it muſt be mixed with collyria. When the aqueous humour of the eye is evacuated at a wound or ulcer of the cornea, he expoſes the patient to the light, from time to time, till the cornea is again raiſed by the aqueous humour; for the light occaſions a motion in the iris, which may prevent its adheſion to the cornea.

Of the Epiphora, *or* Lippitude *of the* Eyes.

An epiphora is a defluxion of a ſalt ſharp humour upon the eyes, attended with itching, pain, and redneſs; as alſo a dimneſs of ſight. It is but ſlight when there is no defect in the bulb of the eye, when the eye-lids ſwell and look red, when the matter of the fluxion is thick and ſometimes glues the eye-lids together in the night, continuing in this ſtate for ſome time.

Children are often afflicted with this diſeaſe, particularly thoſe who have had a ſcald-head improperly cured; or who have ſwellings in the glands of the neck or about the ears, and then it cannot be cured until theſe tumours are diſcuſſed. It ſometimes likewiſe ſucceeds the ſmall-pox and meaſles.

The ſeat of this diſeaſe is in the glands of the eye, eſpecially in thoſe called the lachrymal glands.

This diſeaſe may be certainly cured in the beginning, by a plentiful drinking the infuſion of the leaves of veronica, in the manner of tea, for ſome time. When it is inveterate, the patient muſt be very regular in his diet, and muſt avoid every thing ſalt, ſharp, acid, wine, ſtrong-beer, and drams. His common drink may be a decoction of hartſhorn and fennel-ſeeds, uſing warm pediluvia at night going to bed.

Externally a grain of vitriol may be mixed with unſalted butter, to which a ſmall portion of ſugar of lead may be added and put into the greater corner of the eye. This is a moſt uſeful medicine. When the lippitude is of the dry kind, all acid applications muſt be avoided, and the eyes muſt be covered with a poultice of white bread

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bread and milk, with a little ſaffron mixed with it. The ſucceſs of ſetons and iſſues is uncertain, but a perpetual bliſter on the nape of the neck is of great ſervice. But it muſt be continued for a conſiderable time.

Of the Fistula Lachrymalis.

The fiſtula lachrymalis is a diſeaſe which attacks the great caruncle in the inward corner of the eye, and ſtoping up the natural paſſage of the tears, forces them to run down the cheek: but this is the firſt degree of the diſeaſe. The ſecond is, when pus is mixed with the tears, which proceeds ſometimes from an opening in the ſkin between the noſe and the great corner of the eye. The laſt is, when the pus has not only corroded the neighbouring parts which are ſoft, but has affected the bone which lies underneath. This ſort of fiſtula ſometimes turns cancerous; and Riverius adviſes not to meddle with it at all.

Whatever may be the cauſe of this diſorder, whether the ſmall-pox or the French diſeaſe, it always ſtops up the naſal conduit, which is opened by an operation. See Surgery.

Of Deafness.

The cauſes of deafneſs are a cutting off the external ear, or an obſtruction of the auditory paſſage from wax or other things; from a rupture of the membrane of the tympanum, or when it is corroded or ulcerated, or the auditory nerve is obſtructed or compreſſed. External cauſes are, falls from high places, exceſſive noiſe, ſuch as the exploſion of cannon; likewiſe acute diſorders near their ſtate, which are like to terminate by a critical hæmorrhage.

As to the prognoſtics, thoſe who are born deaf are rarely cured. A real deafneſs is hard to remedy. A deafneſs in acute diſeaſes, with crude urine, foretells a delirium: but, when the ſigns of coction are good, it portends a critical hæmorrhage.

With regard to the cure; if the obſtruction be in the external cavity of the ear, it is diſcernible by the ſight. If there is occaſion to ſyringe the ear, a decoction of ſage and roſemary-flowers will be proper, with equal parts of water and white-wine; but great caution ſhould be uſed. Some pump the head with warm bath waters. Some ſay, the eggs of ants bruiſed and put into the ear, with the juice of an onion, cure the moſt inveterate deafneſs. Others affirm, that a ſalivation will ſometimes perform a cure.

A critical deafneſs will ceaſe of itſelf. Etmuller recommends amber and muſk.

Hoffman ſays, deafneſs ſometimes ariſes from a flackneſs of the auditory nerves, which often happens from too great a humidity, which, if neglected, will terminate in a perpetual and incurable deafneſs, and may be diſperſed, if taken in time, by proper cephalics and ſudorifics. Some for this purpoſe recommend equal parts of ſpirit of lavender and hungary water, which ſhould be dropt warm into the ear. Lindanus adviſes the gall of an eel mixed with ſpirit of wine; and others, the fumes of ſulphur conveyed into the ear, with a pipe or funnel. But regard muſt be had to the cauſe, if diſcoverable.

Of a Tinnitus, *or* Noiſe *in the* Ears.

Hoffman obſerves, that this is cauſed by the ſpaſms of the coats of the ear, which line the inward parts, ſuch as the labyrinth, cornea, and auditory paſſage, which is often attended with intolerable anxiety.

The cure is to be performed, ſays Heiſter, by temperate diaphoretic powders, and reſolving eſſences, commonly called anticatarrhales; as of amber, the woods, roſemary; together with diaphoretics and alexipharmacs, taken often in a day, with tea of betony, with roſemary flowers, ſage, or lavender and ſaſſafras. In the morning, and at noon, the eſſences are to be taken; and at night the powders.

Outwardly, eſſence of amber may be applied, either alone, or with a few drops of oil of amber, or one or two drops of camomile put into the ear with cotton, morning and evening; or a grain or two of amber and muſk, or caſtor in cotton, either alone or with Peruvian balſam; or carminative oils, ſuch as aniſe, fennel, carraways, or calomel; not neglecting pediluvia, and frequent rubbing of the feet and head.

Of a Coryza, *or* Catarrh *of the* Noſe.

A Coryza is too great a moiſture of the noſe, by a thin ſharp ſerum, which gradually becomes thick, and ſometimes coloured.

The cauſe of this diſorder proceeds from the lympha and maſs of blood, moſt commonly in the winter-time, which hurts the noſtrils; at firſt it ariſes from a thin, ſharp humour, which excoriates the parts, which, becoming more thick, almoſt ſtops the noſtrils and hinders breathing. Sometimes it ariſes from ſternutatories too often taken, and from mineral fumes; this is accompanied with ſpitting and a cough. Sometimes the effluvia, affecting the noſtrils, have the nature of a ferment, and become infectious.

As to the prognoſtics, it is without danger, unleſs the lymph is exceeding ſharp and ulcerates the noſtrils, and ſo degenerates into an ozæna, or ſordid ulcer of the noſtrils. Hoffman ſays, this excretion is often ſalutary, and is exaſperated by purges.

With regard to the cure, the irritation is to be ſtopped in the beginning, by joining laxatives with ſudorifics, according to the condition of the patient, the ſeaſon of the year, and the reigning diſeaſes. To ſtop the irritation, oil of aniſeed is very proper; but if the noſtrils are red, painful, and excoriated, it muſt be mixed with barley-flour well dried. Camphor diſſolved in oil of almonds is likewiſe good externally applied, and the ſmell of horns when raſped, as well as the vapours of gum-anime, received into the mouth and noſe. The vapours of amber, frankincenſe, maſtic, and benjamin, are likewiſe uſeful. A coacervation of the mucus may be evacuated by diſtilled oil of marjoram, amber and aniſeed, mixed with leaves of marjoram, and made into ſnuff; or, by a ſternutatory of calcined white vitriol, twelve grains of which may be mixed with two ounces of marjoram water, and filtrated. If the noſtrils are obſtructed, the vapour of vinegar upon hot iron will be profitable. If the head is heavy and dull, the vertex ſhould be anointed with balſam of Peru, which may

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may be made ſtronger with oil of amber. To preſerve the mouth, troches may be held therein, made with mithridate and olibanum.

To preſerve the fauces and windpipe, it is common to take raiſins ſteeped in ſpirit of aniſeed.

Of the Ozæna.

The ozæna is a ſordid ulcer affecting the noſtrils; wherein the humour is very acrid or corroſive, intolerably fetid, ſanious, and often mixed with a bloody mucus.

With regard to the cure, the leaves of tobacco, or tobacco ointment, are very uſeful: If it gathers to a cruſt, it may be removed by oil of ſweet almonds. Some make uſe of the fumes of cinnabar, or inject mercurius dulcis; others uſe precipitate mixed with an emollient ointment, and applied with tents. Some uſe an injection of oil of ſweet almonds, an ounce with a dram of oil of caſtor to ſoften the acrimony of the humours. If the pain be great, they add a ſcruple of camphor and ſaffron, with half a ſcruple of opium. To take away the cruſt, they make a powder of roſemary and lavender flowers, dried lemon-peel, and common ſnuff.

When the matter is well digeſted, the running abated, and the pain gone, it may be cicatriſed with lotions, and waſhed with warm milk.

Of Watching.

Watching is produced by too great a determination of the nervous fluid to the organs of the ſenſes: from its too great influence in the brain, while the lower parts are obſtructed with colds or other cauſes, as in hypochondriac, melancholic, and mad patients, whoſe lower parts are cold: by any irritating body, in whatſoever part it is placed, which diſturbs the ſenſes, and eſpecially the brain: from too great a motion of the humours, while the paſſages of the brain are open: from diſorders, in which the cauſes above-mentioned are predominant; as fevers, phrenſy, melancholy, pains, ſuppurations, and ſuch-like diſorders.

When the cauſe is known, it muſt be removed, if poſſible; and the irritated ſpirits muſt be appeaſed with emulſions, eſpecially of poppy ſeed, or with the thebaic tincture, or theriaca and other opiates in general, not neglecting the original diſeaſes. In fevers, a moiſt ſoftening diet is beneficial; as alſo preparations of barley, emulſions of poppy-ſeeds, and almonds, decoction of ſcorzonera-roots, almond cream, and winter-ſlummery, uſed as aliment; likewiſe tea made of cowſlip-flowers, and gentle laxatives. When the patient is reſtleſs and wakeful the night before a criſis, no hypnotics ſhould be given.

When there is no other diſeaſe, the patient ſhould ſhun all care, and intenſe thinking, eſpecially in the evening; he ſhould uſe exerciſe, and eat light ſuppers. If it is cauſed by pains, they ſhould be appeaſed by antiſpaſmodics, things which temperate, and diaphoretics: if theſe will not do, mild opiates muſt be added. In old perſons, all care and ſolicitude ſhould be baniſhed, the mind ſhould be quiet, and the moderate uſe of generous wine may be allowed in the evening; likewiſe medicines of amber and muſk will be proper, and confectio alkermes or theriaca with wine. The drinking of hot water, and principally coffee, muſt be forbid after dinner.

Of the Incubus, *or* Night-mare.

Willis obſerves, that the incubus rarely ſeizes any one, except during ſleep, and when the ſtomach is oppreſſed with aliment of hard digeſtion, eſpecially if the patient lies on his back.

Thoſe that are ſeized with it, ſeem to have a heavineſs on their breaſts, and about their præcordia; and, if they want to ſpeak, they cannot: ſometimes they ſee ſpectres of various forms, and cannot get rid of the load, or move their body, but after a long ſtruggle: at length they awake, and the imaginary weight vaniſhes; but ſometimes they find a tremor of the heart, and many times a quick and violent vibration of the diaphragm.

Heiſter obſerves, that thoſe who have troubled dreams, or walk in their ſleep, are to be cured in the ſame manner, as proceeding from the ſame cauſe, and ſhould purge, bleed, and uſe a ſpare diet.

Etmuller is much of the ſame opinion, and adviſes the patient to eat ſlight ſuppers, and to lie with their heads raiſed pretty high. If it be very troubleſome, anti-epileptics may be uſed, as well as medicines prepared of ſteel. It frequently affects children, becauſe they eat more than they can digeſt. There are ſome inſtances of its being mortal, though it is generally without danger. Dr White has proved that the incubus is owing to wind in the ſtomach and bowels; and therefore recommends a dram of brandy before going to bed.

Of the Syncope, *or* Fainting.

Heister obſerves, that this diſorder may ariſe from want of ſtrength from profuſe bleeding, from ſudden and violent terror and dread, or from the ſight of any greatly affecting thing. The patient is deprived of ſenſe and motion, either wholly or in part, with paleneſs of the face, and a very weak or low pulſe. They are generally roufed by ſhaking and pulling, or by volatile medicines; which diſtinguiſhes it from the apoplexy.

There are two kinds; the one ſlight, the other grievous. The ſlight kind is attended with paleneſs of the face, diſturbed viſion, ſinging of the ears, and ſometimes with a vertigo; the ſtrength fails, and the patient is almoſt deprived of ſenſe, falls or ſinks down, till ſome proper remedy is applied to the noſe and mouth. The more grievous ſort is, when the patient falls into a delirium, and is deprived of all ſenſe and motion, except breathing, and a very ſmall pulſe; but yet he may be rouzed by ſpirituous medicines and other means, much more eaſily than in the apoplexy.

Beſides the cauſes already mentioned, there may be added the hyſteric paſſion, which ſeems to proceed from ſpaſms; ſome of this ſort are thus affected with the ſmell of ſweet things. Some incur this diſorder by deep ſtudy, great inanitions, and faſting.

With regard to the prognoſtics, it has generally more terror than danger attending it, unleſs it proceeds from profuſe bleeding, or wounds, or a loſe of ſtrength by o-

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ther diſeaſes, or a moſt violent terror. The ſlighter fainting-fits have little danger; and patients are brought to themſelves by volatile medicines, taken by the mouth, or applied to the noſtrils.

As to the cure, if the ſlighter ſort happens when a vein is opened, or from the ſight of blood, wounds, ulcers, or any chirurgical operation, which proceeds from horror and fear, affecting the imagination, it often happens that changing the room, and going into freſh air, will perform a cure. But if any thing hinders this, that they can neither walk nor leave the room, the ſmell of hungary water alone, or volatile ſpirits, or wine and ſtrong vinegar, or ſprinkling the face with cold water, or a draught of generous wine, will bring them to themſelves.

In more grievous fainting fits, where gentle cordials are of little uſe, the ſtronger ſort muſt be applied, ſuch as ſpirit of ſal ammoniac to the noſtrils, temples and pulſes, with ſtrong frictions; or 40 or 50 drops of volatile ſpirits may be given inwardly, to which may be added cinnamon water, orange-flower water, or the like; not forgetting a draught of generous wine, with vellications and frictions of the extremities of the noſe, ears, head, hair, *&c.* till they recover.

When the patient is hyſteric, none but fetid things ſhould be applied to the noſe, ſuch as caſtor, aſa-fœtida, partridges feathers burnt, or burnt leather, horn, or the like; as alſo fetid ſpirits, in a grievous fit; not omitting vellications and frictions of the aforeſaid parts.

Of the Spasm *of the* Lower Jaw.

In the ſpaſm of the lower jaw, when the patient can neither open his mouth, nor eat, as when perſons are wounded, and ſomething foreign is lodged therein, or when the nerves are hurt, or when ſharp things, ſuch as vitriol, are applied to ſtop the blood, the cure muſt be performed according to the diverſity of cauſes, as particularly treated of in ſurgery. But when this happens ſpontaneouſly in infants, they generally die, though the beſt nervous and antiſpaſmodic medicines have been uſed both inwardly and outwardly.

Of the Cynic Spasm, *or* Convulſion *of the* Muſcles *of the* Mouth.

A Cynic ſpaſm, if it proceeds from vegetable poiſons, as it generally does, they are to be expelled immediately from the body by a vomit, and then giving generous wine, warm with ginger or pepper. If it happens from other cauſes, it muſt be treated with antiſpaſmodics and nervous medicines, both inwardly and outwardly; and chiefly with plaſter of betony and bay-berries, prepared with oil of amber, and applied to the temples, and behind the ears.

Of the Palpitation *of the* Heart.

The heart often palpitates ſo much as to be heard at a diſtance by the by-ſtanders, which they ſuppoſe to be an affection of the thorax. This may ſometimes happen, from a violent motion of the body, chiefly when aſcending high places, and principally in thoſe who are plethoric and hypochondriac. Sometimes it is cauſed by fear or dread, when the blood is forced too violently to the heart. When it proceeds from violent motion or terror, and returns often, it cauſes a kind of polypus, as is evident from the diſſection of thoſe bodies who have died of this diſeaſe. Hence, almoſt a continual palpitation ariſes. Sometimes it proceeds from a bad conformation of the heart and the neighbouring veſſels, ſuch as an aneuriſm of the aorta, when it becomes boney.

Others affirm, it ſometimes may be cauſed by wounds in the ventricles or abſceſſes in the heart; or from wind, or a diſorder of the animal ſpirits, inducing ſpaſmodic affections.

In the beginning of the cure, if the patient is plethoric, or when uſual bleedings have been ſtopt, it will be proper to bleed, by way of preſervation, in the ſpring and autumn.

Beſides this, ſaline, nitrous, and cinnabarine temperating medicines are to be uſed, particularly antiſpaſmodics, to appeaſe the motion of the heart, and render the blood more fluid. The aqueous infuſions of tea, balm, veronica, primroſes, or citrons, are likewiſe proper, eſpecially with the eſſence of ſcordium, carduus benedictus, citron, or orange-peel, with a little dulcified ſpirit of nitre, taken morning and evening; as alſo temperate pediluvia, moderate frequent exerciſe, riding, moderate diet, plenty of thin drink, whey, mineral waters, eſpecially the chalybeate kind, are very uſeful in this diſeaſe.

Of a Polypus *of the* Heart.

A Polypus is a maſs compoſed of various pellicles and fibres, generated in the heart and large veſſels. They are generally founded in acute as well as chronic diſeaſes; and there are few bodies to be met with, wherein they are not to be found after death. Its principal ſeat is in the heart, pulmonary artery, and the aorta.

They principally attack the ſanguine conſtitutions, and patients who have ſmaller veſſels, ſoft fibres, of a ſedentary life, who drink little, or are free in the uſe of acid wines and ſpirituous liquors, as alſo thoſe who eat large ſuppers.

The beginning of a polypus may be known by a compreſſion of the breaſt, a fixed pain about the heart, and when it increaſes there is a frequent palpitation of the heart, from a ſlight cauſe, and the pulſe is ſtrangely unequal and often intermits. When there is a violent motion of the body, or the patient has taken a medicine which diſturbs the blood, or the mind is violently affected, a ſhortneſs of breath and an incredible anxiety of the heart will ariſe. Laſtly, there are frequent faintings without any evident cauſe, or from a certain poſition of the body. If the blood is let fall into hot water, it will congeal like jelly, and cleave into white filaments.

In the cure, an exact regimen and diet muſt be made uſe of, with a frequent exerciſe and motion of the body, and mineral waters, eſpecially thoſe of the chalybeate kind, and abounding with alkalious ſalt.

Of the Hiccup.

A Hiccup is a ſpaſmodic affection of the ſtomach and diaphragm, ariſing from any thing that irritates and vellicates their nervous coats. When it proceeds from a ſlight error in diet, it will ſoon end ſpontaneouſly, or by drinking any thing which dilutes the acrid matter. Sometimes it

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it is of a more grievous kind, and may proceed from a hurt of the ſtomach, poiſon, an inflammation of the ſtomach, inteſtines, bladder, diaphragm, or the reſt of the viſcera. Sometimes, immediately before death, it may proceed from gangrenes of the outward parts. In acute fevers, and chiefly the malignant, a hiccup is frequent, and often fatal.

When it happens in old or weak perſons, from a plentiful meal, eſpecially from hard and flatulent aliment, a draught of generous wine, or a dram of any ſpirituous liquor, will generally take it away. Likewiſe ſtomachic powders mixt with Peruvian bark, and taken in generous wine, are profitable; as alſo if it proceeds from cold, or drinking cold liquors.

When it proceeds from other cauſes, eſpecially from acid humours in the ſtomach, abſorbent and alkalious medicines are good. If it proceeds from an acute fever, or an inflammation of the ſtomach, it is a dangerous diſeaſe. However, dulcified ſpirit of nitre, joined to an alexipharmac, and given often, is proper; a dram or two of diaſcordium, given in the evening, may perform a cure. If it proceeds from a gangrene or mortification, it is generally incurable: but Peruvian bark, with medicines againſt internal inflammations, is moſt likely to ſucceed. If a poiſon is the cauſe, plenty of milk muſt be taken with oil, as has been already taught.

Of the Soda, *or* Heart-burn.

This diſorder is a heat or troubleſome burning about the pit of the ſtomach, or its left orifice, which ſometimes is extended the whole length of the oeſophagus, with a preſſure or ſpaſmodic conſtriction, uſually attacking the patient by fits. The cauſe is generally fat aliment, if cold drink be taken ſoon after. In ſome it proceeds from acids, in others from aromatics, ſpirituous liquors, or bilious humours. It frequently torments pregnant women. This diſorder is generally ſlight, and vaniſhes of its own accord; but in ſome it is of long duration.

In the cure, the cauſe muſt always be attended to: If from acids, abſorbents are proper, particularly crabs-eyes and prepared ſhells, mixed with a fourth or fifth part of powder of nutmeg, given to half a dram. It is common to take chalk alone, or mixed with nutmeg; but care ſhould be taken not to be too free in its uſe. Oil of tartar *per deliquium*, given from 20 to 30 drops, in tea, coffee, broth or warm beer, is uſually efficacious; as alſo tincture of tartar and ſpirit of hartſhorn. If it proceeds from bilious humours, 30 or 50 drops of dulcified ſpirit of nitre in water, tea, or coffee, will take away the pain. When it is cauſed by fat things, and draughts of cold liquor, a dram of brandy is good. Now and then laxatives ſhould be given, to carry off the humours. In ſanguine conſtitutions, bleeding may be proper.

Of the Cardialgia, *or* Pain of the Stomach.

Of all pains of the ſtomach, the cardialgia is the moſt ſevere. It is a ſpaſmodic pain of the orifice of the ſtomach, ſometimes of the right and ſometimes of the left. One kind of this diſorder may proceed from a ſharp cauſtic, or poiſonous matter; ſometimes it ariſes from a redundant or cauſtic boil, or from a dyſentery. At other times it may proceed from the blood, when any uſual evacuations are ſuppreſſed, and the nervous membranes of the ſtomach are diſtended thereby. Hence it often happens to women after the fiftieth year; and, in the cure, bleeding or ſcarifications are proper: on the other hand, if it is deduced from a cauſtic matter in the ſtomach, oily appeaſing things, aſſes milk, an infuſion of camomile flowers, cream, with abſorbents, are proper. It muſt be diſtinguiſhed from a painful inflation of the ſtomach, in which there is a tumour like a bladder under the falſe ribs, chiefly on the left ſide, and under the pit of the ſtomach; but the inflation is generally on the right ſide, with great difficulty of breathing. This is common in infants before they are weaned; but more ſo in hypochondriacs, if they are too luxurious.

If it proceeds from the remains of the aliment grown ſharp, whence flatulencies ariſe, it generally gives way to tea or coffee alone, or a decoction of camomile flowers, eſpecially mixed with ſtomachics; likewiſe preparations of fennel, aniſe, orange-peel, and other carminatives are uſeful; as alſo a dram of the powder of orange-peel, or camomile-flowers, with a few grains of ſaffron, in an ounce or two of wine.

When the ſtomach is too much filled with aliment difficult of digeſtion, or fat things, a gentle emetic will be neceſſary, eſpecially if there is a nauſea or reaching to vomit; after which, a ſufficient quantity of warm water muſt be drank, to waſh the ſtomach: this will be beſt promoted with a decoction of carduus benedictus, or half a dram of tartar-vitriolate, ſalt of worm-wood, and the like; after which ſtomachics muſt be given.

In a very violent cardialgia, from congeſtions of blood, vomits are improper, but bleeding neceſſary, with antiſpaſmodics of tartar-vitriolate, nitre, cinnabar, crabs eyes, and the like, in a proper vehicle; as alſo ſpirit of hartſhorn mixt with tincture of tartar to 50 or 60 drops. To theſe may be added emollient and anodyne clyſters, and a bladder of hot milk, with camomile flowers, applied to the pit of the ſtomach.

Of Flatulencies *and* Eructations.

The cauſe of theſe diſorders is generally a weak ſtomach, and crude flatulent aliment, ſuch as peaſe, beans, lentils, coleworts, turnips, radiſhes, hard fat fleſh, and the like; which degenerate into wind, creating great anxiety, if not evacuated, and difficulty of breathing. It is a diſorder familiar to hypochondriacs, and, the ſtomach being ſtrongly contracted, the wind breaks out with violence.

Another cauſe of flatulencies are congeſtions of blood in the branches of the vena portæ; whence proceed anxieties of the præcordia, difficult breathing, colic pains, and the cardialgia, and, by conſent of the ſtomach with the head, pains in the head, the vertigo, and watchfulneſs.

If it ariſes from crudities in the ſtomach, evacuations are neceſſary firſt of all; and then ſtrengtheners, aromatics, bitters, and carminatives, ſuch as have been mentioned in the preceding diſeaſes; with a ſparing diet and excerciſe.

If it proceeds from congeſtions of the blood in the branches of the vena portæ, which is the caſe of hypochondriacs, or when uſual bleedings are ſuppreſſed, a vein muſt

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muſt be opened; if the body is coſtive, an emollient clyſter or a gentle laxative will be proper. If theſe fail, chalybeate medicines muſt be uſed, ſuch as the tincture of vitriol of mars, ſteel-filings finely powdered to 6, 8, or 10 grains, or oil of cinnamon with ſugar, or bitters, or ſpaw-waters, with conſtant exerciſe.

Of Worms.

Worms are various with reſpect to their ſhape and magnitude, and have their ſeat in the ſtomach and inteſtines. The round are furniſhed with a proboſcis, and a kind of crooked claws, wherewith they ſometimes gnaw and tear the membranes. If theſe lodge in the ſtomach, their bites are attended with an inexpreſſible pain, anxiety, inquietude, nauſea, and flux of ſpittle; a fetid ſmell exhales from the mouth; the countenance is now pale, and then red; there is an itching of the noſtrils, with an inclination to vomit, and a dry and troubleſome cough by fits, and ſometimes fainting.

When they are contained in the inteſtines, eſpecially the ilion, then they produce the following ſymptoms. The belly is ſtrangely diſtended, eſpecially in infants, and they ſeem to be afflicted with the tympany, with now and then a diarrhœa, and the fæces are of an aſh-colour, not unlike cow-dung; the upper parts waſte away, inſomuch that the bones are viſible, and yet the appetite is great. The face is generally pale and tumid; the excrements ſeem to be full of cucumber-ſeed, or the like.

The ſigns of the aſcarides are as follows: Their ſeat is chiefly in the groſs inteſtines, and they are moſt plentiful in the rectum. They are like book-worms, and are thrown out in large quantities. They have many things in common with the other inſects, and produce inflation of the belly, leanneſs, and a nauſea; they are attended with a great itching of the anus, and cauſe fetid excrements.

The broad worm, called tænia, is like a narrow tape two or three ells long. or longer, divided through the whole length with croſs joints or knots. Andry affirms, that there is only one in the body at a time, and therefore is called ſolium.

The Greeks called the remedies againſt worms anthelmintics; the moſt approved of which are aſa-fœtida and ſagapenum, eſpecially if mixed with purges, ſuch as mercurius dulcis, and extract of rhubarb in pills; with this caution, that before and after the uſe of them, a few ſpoonfuls of ſalad oil, or oil of ſweet almonds ſhould be taken, for all things of that kind are of great uſe. The ſeeds of cina, ſantonicum, and tanſey, are likewiſe uſeful, by reſiſting the putredinous colluvies, and reſtoring the tone of the inteſtines.

Some affirm, that bitters are good remedies, as the tops of wormwood, the leſſer centaury, ſcordium, and flowers of tanſey; likewiſe Peruvian bark, and eleutheria, in beer or wine, chiefly canary, in which ſome ſpoonfuls of the infuſion or decoction ſhould be taken every day. Aloes, myrrh, and corallina, are likewiſe powerful medicines in a proper vehicle, or with honey, in the form of an electuary. The freſh juice of water-creſſes, taken every morning for ſome days, is likewiſe proper.

The filings of ſteel diſturb the lumbrici and aſcarides; as alſo Spaw waters; likewiſe ſpirit of vitriol or ſulphur, and the elixir of vitriol: Wine itſelf is not a bad thing drank at meals.

Medicines of quickſilver are likewiſe good, eſpecially half an ounce of it boiled in a pint of wormwood water, in a glaſs-veſſel, for half an hour, ſtirring the quickſilver with a ſtick: the doſe is a ſpoonful for a boy, often in a day: an adult may take three, in an ounce or two of ſolutive ſyrup of roſes; or it may be boiled in milk, if the children prefer it.

If theſe fail, a purge ſhould be given every third or fourth day; ſuch as mercurius dulcis, with aloes, diagridium, reſin of jalap, or troches of alhandal.

When internal things are rejected, the belly may be anointed with oxes gall made hot, two or three times a-day, or with oil of coloquintida, or of wormwood, with diſtilled oils of wormwood and tanſey, to which the decoction of quickſilver with milk may be added.

To kill the aſcarides, chalybeates are good, and mercurial purges, with clyſters of a decoction of wormwood, ſeeds of cina, myrrh, and quickſilver, to which may be added an ounce and a half or two ounces of oil of wormwood made by decoction. Or the clyſter may be of ſalad oil, or oil of ſweet almonds, or linſeed alone, and injected often.

The powder of tin has been uſed many years as a remedy againſt worms, and particularly the flat kind which often elude the force of other medicines; but the ſucceſs of this depends upon the proper doſe, and then it will have remarkable effects.

Take an ounce and an half of pewter, and grind it to a fine powder, and mix it with half a pint of treacle.

To adults give two ounces of the powder of pure tin, ſifted through the fineſt hair ſieve, mixt with eight ounces of treacle, after the patient has been purged with an infuſion of ſena and manna.

Of Difficulty *or* Suppression *of* Urine.

Difficulty of urine ariſes generally from a ſtone, or from an inflammation of the kidneys or the neck of the bladder. In ſanguine perſons, it may proceed from the ſuppreſſion of ſome uſual hæmorrhage, or from the blind piles; or there may be a congeſtion of blood in the ſpungy or cavernous part of the urethra, which may be ſo diſtended and inflated, as not to tranſmit the urine, or at leaſt with great difficulty. In ſome it may be owing to a ſpaſm of the neck of the bladder, or to ſharp urine; in others to a palſy of the bladder, or a caruncle of the urethra; or from a tumour, abſceſs, or ulcer, in the proſtrate gland; or from its being too large, or indurated, as often happens. Likewiſe in bloody urine it is not ſeldom ſuppreſſed; at leaſt it is expelled with great pain and trouble, which proceeds from a concretion of blood. Etmuller affirms, that a dyſury is generally occaſioned from the want of mucus of the urinary paſſage, or its being worn off.

As the cauſes of an iſchury are various, they ought to be carefully diſtinguiſhed from each other. When it proceeds from an inflammation of the kidneys, the pain and heat are principally in that region, attended with a fever; if from a ſtone in the kidneys, it is accompanied with vomiting; if from a ſtone in the bladder, there is a violent pain

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pain in the bladder, which is extended to the very extremity of the urethra; a mucus or pus is excreted with pale urine; and, upon proper examination, the ſtone may be felt; but the moſt certain ſign is ſearching the bladder with a catheter. When this diſorder ariſes from a ſtone in the urethra, it may be eaſily felt. If from an inflammation of the neck of the bladder, there is a tumour and pain in the perinæum; but it may be beſt perceived by thruſting the finger into the anus, and turning it up towards the bladder; for a tumour will be perceived by the phyſician, and by the patient a burning and preſſing pain; and when a catheter is introduced into the urethra, an impediment will be felt near the neck of the bladder, which will hinder it from proceeding further. To theſe ſigns may be added, when the diſorder is great, a teneſmus, a conſtriction of the anus, an anxiety of the præcordia, coldneſs of the extreme parts, vomiting, and a frebile pulſe. When the cavernous ſubſtance of the urethra is too much diſtended with blood, and the urine is ſuppreſſed, a ſilver pipe cannot be admitted into the urethra, eſpecially if the patient abounds with blood. When there is a ſpaſm in the neck of the bladder, it appears from the cauſes aforeſaid; and likewiſe the patient perceives a ſpaſmodic conſtriction about the neck of the bladder, and a catheter will paſs thereto, but no farther; and there are no ſigns of a ſtone in the urethra or bladder.

If the urine is ſharp, and produces a ſpaſm, we may diſcover it from its being very ſtinking, eſpecially if the patient is old or ſcorbutic; and there are many ſaline particles in the urine like lime. When there is a caruncle in the neck of the bladder, it may be known from the ſigns mentioned in the lues venerea, where the cure is treated of. An abſceſs in the proſtrate gland often is miſtaken for a caruncle. When a ſcirrhus of the proſtrate gland is the cauſe of a ſupreſſion, there is a hard or indolent tumour in the perinæum, or at leaſt the pain is not great.

When the urinary paſſages are obſtructed by ſolid bodies, that is, the pelvis of the kidneys, the ureters, or the neck of the bladder, or the urethra, from a ſtone contained therein; if it be ſmall, diuretics will be proper, which are mentioned in a fit of the gravel or ſtone; to which may be added a decoction of eringo-root and Epſom ſalt or Selters waters taken often therewith. But if the ſtone is large, and cannot be excreted by this means, ſtrong diuretics are highly hurtful, and it muſt be cured by ſection; (ſee SURGERY.) But if the patient is too weak, or too old, and cannot undergo the operation, the ſtone, if poſſible, muſt be driven back: and the pains muſt be appeaſed with antiſpaſmodics internally, and with lenients, lubricant and oily medicines, as well as gentle anodynes: Externally, with emollient clyſters, ointments, liniments, and baths. If the pains are violent, lenient injections may be thrown up into the bladder, of ſalad, linſeed, and white poppy oil, or oil of ſweet almonds, or a decoction of linſeed or roots of mallows in milk, with the addition of a little freſh butter. This done, the patient muſt have recourſe to lime-water.

If the urine is ſuppreſſed from an inflammation of the kidneys or bladder, diuretics are pernicious, and mineral waters not ſafe; but rather refrigerating nitrous remedies, neutral ſalts, crabs-eyes, tartar-vitriolate, may be given, with a grain of camphor in every doſe. To render them more efficacious, they may be joined to a decoction or infuſion of parſley roots, eringo-tea, ground-ivy, or the like; likewiſe emulſions of the four colds ſeeds, with crabs-eyes, calx of antimony, and nitre, or ſeeds of violets, which are laxative and gently diuretic: to theſe may be added fomentations, and a bladder filled with hot milk or water, or emollient and reſolvent cataplaſms, applied to the region of the kidneys or bladder, or perinæum, according to the place of the inflammation, as well as baths of the ſame kind: but above all, bleeding is neceſſary, eſpecially in the plethoric, and the promoting of uſual hæmorrhages. In the mean while aperients and reſolvents muſt be given, ſuch as powders of crabs-eyes, arcanum duplicatum, tartar-vitriolate, and nitre; or medicinal waters, with bitter cathartic ſalts given now and then.

When the ſpungy ſubſtance of the urethra is ſwelled with blood, and as it were inflated, a copious bleeding is the principal remedy.

When a ſpaſm affects the neck of the bladder, it muſt be treated with temperating and antiſpaſmodic powders, diuretic waters, and infuſions, with emulſions, or lenient oils now and then, ſuch as ſalad-oil, oils of ſweet almonds, poppy or linſeed: externally, cataplaſms, ointments, clyſters, and baths, of the emollient and demulcent kind; with gentle opiates, if the diſeaſe requires them.

If the ſpaſm proceeds from a ſharp urine, from the ſurvy, or otherwiſe, it muſt be treated with gentle purges and diaphoretics, and abſorbents, ſuch as crabs-eyes, mother of pearl, prepared chalk, calx of antimony, and amber; with lenient decoctions of china root, ſarſaparilla, or mallows, with emulſions and demulcent oils; to which may be added ſyrup of marſh-mallows; when the pains are violent, they muſt be appeaſed with moderate opiates.

If the difficulty proceeds from blood remaining in the bladder, or its neck, the concretion is to be reſolved and expelled with warm infuſions of digeſtive herbs drank like tea, ſuch as ground-ivy, arnica, chervil, or veronica; with tincture of tartar, or liquor of the terra foliata of tartar, with digeſtive powders of crabs-eyes, ſaturated with the juice of oranges or lemons, ſperma ceti, tartar-vitriolate, nitre, and cinnabar: to which may be added the water of chervil or parſley; with roaſted onions applied hot to the region of the pubes, perinæum; or cataplaſms of wheat-flour boiled in milk, with butter and a little ſaffron, or with white lily roots, mallows, marſh-mallows, or camomile flowers applied to relax the ſpaſm of the neck of the bladder; or with a bladder of hot milk, in which camomile-flowers have been boiled; with emollient and reſolvent clyſters of camomile-flowers boiled in milk, with oil or freſh butter: but, if all theſe fail, a catheter is to be introduced into the neck of the bladder, to break the concretion, and evacuate the urine.

When there is an ulcer in the bladder, which will appear from purulent and fetid urine, with a moſt violent pain in the bladder, as if a ſtone was contained therein; all ſharp and ſtimulating things muſt be avoided, and the infuſions of vulnerary abſorbent roots and herbs muſt be given with mucilages and ſoft balſamics, eſpecially balſam of Mecca, Tolu, &c. with a moderate uſe of quickſilver,

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eſpecially if the caſe is venereal. Then mineral waters may be drank, either alone or with warm milk, for ſeveral weeks, or the hot bath waters: to theſe may be added injections of a decoction of the traumatic herbs, ſuch as agrimony, St John's wort, plantain, or yarrow; or, in their ſtead, milk with ſyrup of marſh-mallows, or freſh butter, or oil of St John's wort.

If there is a difficulty of urine in pregnant women towards the laſt months, diuretics muſt be ſhunned. The beſt remedy in this caſe is to eaſe the preſſure upon the part; but, if that will not do, to uſe a catheter.

Laſtly, if it proceeds from a ſwelling of the proſtate gland, or if it is become ſcirrhous, it muſt be treated as ſuch, as will be hereafter taught.

But, if theſe remedies will not do, the bladder muſt be pierced with a trochar, which is called the puncture of the perinæum; and, when the perforation is made, the water muſt be evacuated, as in the dropſy: The inſtrument muſt be left in the wound, and be faſtened in ſuch a manner that it does not fall out, that ſo the urine may be made as often as there is occaſion: It is a troubleſome operation, but the only one left.

Of the Diabetes.

A Diabetes happens when the urine comes away crude, exceeding the quantity of liquids drank, attended with weakneſs, which generally proceeds from the kidneys, which are too weak and lax, eſpecially in thoſe who have been accuſtomed to drink too much. Heist.

Liſter obſerves, that a diabetes comes ſlowly on, and is a long while in breeding. In the beginning, the mouth is dry, and the ſpittle a little white and frothy; the urine being ſomewhat more than uſual, with a ſmall thirſt. A heat begins to be perceived in the bowels, which is a little pungent; the patient falls away, and the mind is anxious and unſtable. In time the thirſt greatly increaſes, the urine is plentiful, and the body waſtes. When they make water without intermiſſion, the thirſt becomes intolerable; and, though much is drank, it is not proportionable to the water. When the urine is retained a little while, there is a ſwelling of the loins, ilia, and teſtes, and it comes away with pain. Now death is at hand. The urine is pale, not ſweet, but it is more ſweetiſh at laſt than at firſt.

Strengtheners, moderate aſtringents, and ſpecies of hyacinth, with crocus martis, are good in this diſeaſe, eſpecially with anodynes: or Japan earth, or the tincture of vitriol of mars, red wine with water in a ſmall quantity: the drink ſhould be ſparing, and all exceſſes avoided. Exerciſe and frictions of the body are likewiſe profitable, becauſe they ſtrengthen the parts, and increaſe perſpiration.

Liſter ſays, almonds and a milk diet are proper in this diſtemper; as alſo wine with ginger; allowing in the mean time a draught of milk and water to allay the thirſt.

Willis declares, he has often preſcribed tincture of antimony with good ſucceſs; and lime-water with ſaſſafras, aniſeeds, raiſins, or liquorice.

Of WOMENS DISEASES.

Of the Chlorosis, *or* Green-Sickneſs.

Sydenham looks upon this to be a ſpecies of the hyſteric affection, and is known by a paleneſs and diſcolouration of the face and the whole body. The complexion appears a little ſublivid or greeniſh, with a red or dark circle under the eyes; the face is bloated, the eyelids and ancles are apt to ſwell; the whole body is heavy and dull; there is a tenſive laſſitude of the legs and feet, difficulty of breathing palpitation of the heart, pain of the head, a feveriſh pulſe, a drowſineſs; a pica, or deſire of eating unfit things, ſuch as coals, chalk, *&c.* and a ſuppreſſion of the menſes. The clavus hyſtericus often attacks patients in the height of this diſorder.

The cure is to be attempted with chalybeate medicines, ſuch as are preſcribed in the hyſteric diſorder, given according to the patient's age, drinking wine after them; or the corroborating infuſion with angelica root. If the patient is not very weak, ſhe may be purged once or twice before the courſe is entered upon.

Heiſter recommends attenuants, evacuants, and ſtrengtheners, with a good diet and exerciſe; particularly from v to viij grains of powder of ſteel, with half a ſcruple of a proper elæoſaccharum, or with bitter extracts given in the evening; as alſo emmenagogues at due times, with pediluvia and bleeding in the foot about the time of menſtruation. If theſe will not ſuffice, he thinks matrimony a certain cure.

Of the Suppression *of the* Menses.

As ſoon as a healthy female arrives at her full growth, ſhe generates more blood than can be conveniently contained in the veſſels; wherefore the ſuperfluity is evacuated by the uterine arteries, and is called the *Menſes*.

Boerhaave obſerves, that in a ſuppreſſion of the menſes there is a plethora, with a liſtleſſneſs to motion; a heavineſs, a paleneſs, a pain of the loins and of the groin; all the functions, whether natural, vital, or animal, are depraved. Sometimes the menſes will force a way thro' the eyes, ears, noſtrils, gums, the ſalival ducts, bladder, breaſts, ſkin, wounds, or ulcers.

Hence often ariſes a depravation of all the viſcera, as alſo diſeaſes without number, partly from a putrefaction already begun, and partly from the hurt which the veſſels have received.

From this diſorder proceed want of appetite; the pica and malacia, or a depraved appetite. If it is habitual and obſtinate, a ſcirrhus or dropſy of the womb are to be feared, or a rupture of ſome blood-veſſel, eſpecially of the lungs. It is not ſo dangerous when the uterus is not infarcted, or when there is no other ſymptom of the menſes. If this diſeaſe is attended with the fluor albus, it may become habitual, and from yellow become green and acrid, corroding the uterus, and laying a foundation of a dropſy therein

Things which retard the menſes are, immoderate cold, ſorrow, a ſudden fright, too great evacuations, incraſſating

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ting diet, a crudity of the humours, acids, and aſtringent medicines.

This diſorder is to be cured in the ſame manner as the hyſteric affection; but, if the remedies for that fail, the patient muſt take every morning five ſpoonfuls of an hyſteric julep, with twelve drops of ſpirit of hartſhorn; and every night a ſcruple of compound powder of myrrh made into a bolus, or pills with ſyrup of lemons. Allen recommends cantharides and camphor; the doſe is from two grains to ſix.

Hoffman directs chalybeates, or pills made of aloes, myrrh, ſaffron, amber, caſtor, and round birthwort. Pitcairn thinks mercury more efficacious than ſteel.

If the fluids are inclinable to ſtagnate, their fluidity may be preſerved by fomentations and frictions of the feet; by opening a vein in the foot, and bleeding elſewhere; by giving uterine purges; by emmenagogues; by plaſters, fomentations, liniments, vapours and heat; by ſtrengthening the veſſels debilitated with a plethora, by chalybeates and aſtringents.

Uterine cathartics are aloes, myrrh, bryony, colocynthus, gum-ammoniac, bdellium, ſagapenum, opopanax, aſa-fetida, galbanum, and elixir proprietatis.

Emmenagogues, beſides the former, are, ariſtolochia, mugwort, motherwort, camomile, juniper, marjoram, marum, feverfew, pennyroyal, rue, ſavine, ſage, elder, wild-thyme, tanſy, thyme. To which may be added balm, roſemary, wall-flowers, ſaffron, bay and juniper berries, amber, rhubarb, and aromatics. As alſo borax, alkaline and volatile ſalts; warm, ſtimulating, acrid, and aromatic oils; the barks of guaiacum, ſaſſafras, cinnamon, and juniper; the rinds of oranges, citrons, and lemons.

Reſolving plaſters are thoſe of cummin, melilot, galbanum, bayberries, labdanum, oxycroceum, which muſt be applied to the ſoles of the feet, navel and groin. The fomentations may be made of Venice ſoap, and ſome of the above mentioned herbs.

Of the Immoderate Flux *of the* Menses, *or* Uterine Hæmorrhage.

Every large flux of blood from the uterus is not to be eſteemed noxious, but ſuch only as is attended with loſs of ſtrength, which brings on other ſymptoms, ſuch as want of appetite, crudities from indigeſtion, a ſenſation of weight near the regimen of the ſtomach, an ill colour in the face, a languid pulſe, often with a gentle heat, an œdematous ſwelling of the feet, and a diſturbed ſleep without refreſhment

Sometimes the menſes flow in too great plenty and with impetuoſity at the uſual period; ſometimes twice or oftener in a month; ſometimes again they continue ſeveral days longer than ordinary.

This flux ſometimes conſiſts of thin florid blood, which happens chiefly in abortions; and from a retention of pieces of the ſecundines, which keep the mouths of the veſſels open Sometimes there are coagulated and clotted maſſes like fleſh come away with the blood, of the ſize of an egg, which is occaſioned by a ſtoppage of the menſes for two or three months. At other times the blood is grumous, coagulated, and black; generally on the firſt days of child-bed, in ſlender and plethoric ſubjects. When the patient is cachectic, and the flux continues long, it is thin, watery, and mucid. In the ſcorbutic, it is corrupt and fetid, with acrimony and pain. In the younger ſort, before child-bearing, if the evacuation be immoderate, it is commonly followed by a fluor albus, or the dripping of a white, impure, mucid matter.

The cauſe may be referred to a copious and impetuous afflux of blood to the uterus, and an unequal and impeded reflux by the veins; which diſtending and relaxing the uterine veſſels, make the orifices too wide, or rend and corrode them, by which the blood flows too freely. This may happen from a plethora, or when there has been a long ſuppreſſion, or an abortion, or a difficult labour. It generally happens to women about the fiftieth year, when the menſes are going to leave them; and not always without danger. It ſometimes happens to women upwards of ſixty, which, if attended with a flow fever, haſtens death.

The concomitant ſigns are generally theſe: A tenſion and inflation of the hypochondria, a heavy preſſing pain about the loins, ſometimes with a chilneſs; a coldneſs of the extremities, a ſinking of the veſſels, a paleneſs of the face, a quick pulſe, with an internal heat, a coſtiveneſs, and little urine; all which ſhew there is not only a debility and laxity of the uterus, but ſpaſmodic ſtrictures of the vaſculous and nervous parts, which force the blood to the uterus.

If the body is cacochymic or ſcorbutic, or full of bad humours, or afflicted with the venereal diſeaſe; when the viſcera are unſound, and the liver, ſpleen, and meſeraic veins, are ſtuffed with thick blood, the caſe is dangerous and troubleſome; for the fault of the fluids and cachexy continually increaſe: Beſides, the more the ſtrength is weakened, the more the ſtomach and digeſtion are hurt; the blood is depraved, and the excretions diſturbed and leſſened. When this happens to women when the child is dead, their lives are in great danger, and nothing but ſpeedy aſſiſtance from a man-midwife can ſave them. The caſe is alſo dangerous when the ſecundines are violently extracted, or parts of them are retained, and which ſometimes degenerates into moles.

Immoderate evacuations are produced by a ſedentary life, which gives room for abundance of thick chyle and milk. It is cauſed likewiſe by too frequent uſe of ſalt, acrid, and ſeaſoned meats; by ſpiritous liquors, *&c.* by violent agitations and paſſions of the mind, from loſſes, gaming, love, anger, *&c.* It may be obſerved likewiſe, that violent exerciſe does as much harm as the moderate is ſerviceable, eſpecially if the patient is ſubject to this flux from other cauſes; ſuch as immoderate repetitions of the venereal act, eſpecially in women of a delicate conſtitution; too frequent child-bearing.

The cure ſhould reſpect the reſtraining a preſent flux, and the keeping within bounds a future one.

It ſhould be begun with reſt, if convenient, in bed; the patient lying on her back, and ſilent as much as poſſible. Bleed in the arm, according as the conſtitution and ſtrength of the patient, as well as the urgency of the ſymptoms, will admit or require Avoid ligatures of the limbs. Let the patient fare ſlenderly on veal and chicken-broths,

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broths, fiſh ſoups; and drink a ptiſan of nettle-tops, yarrow, and plantane, with orange-peel, or of the greater comfrey; if ſhe be hot and bilious, with linſeed.

If theſe fail, have recourſe to aſtringents.

Of the Fluor Albus, *or* Whites.

The fluor albus conſiſts in the efflux of a whitiſh, lymphatic, ſerous, or aqueous humour, from the matrix.

It is ſometimes white, ſometimes pale, yellow, green, or blackiſh; ſometimes it is ſharp and corroſive, ſometimes foul and fetid: the face is diſcoloured, there is a pain in the ſpine of the back, the appetite is loſt, and the eyes and feet ſwell. Some women have a periodical flux of the whites inſtead of the menſes.

The ſymptoms are, a pain and weight in the loins, which is worſt in the lymphatic flux, as being attended with a ſwelling of the uterus, turbid urine, barrenneſs, a proneneſs to abortion; a loathing of ſome things, and longing for others; indigeſtion; thickneſs and crudity of the blood; whence proceed œdematous ſwellings of the feet by day, and of the face by night; difficult breathing, palpitation of the heart, ſyncope, relaxation of the ligaments of the uterus, a total or partial procidentia uteri: if the flux is acrid and corroſive, it ulcerates the vulva; creates phlyctenæ; which laſt generally proceed from a ſcirrhus or cancer in the uterus; a ſlow fever; dropſies of different parts; of which, or a conſumption, the patient generally dies.

It may be known from a virulent gonorrhœa; becauſe this is attended with pain and an inflammation of the external parts of the pudenda, chiefly about the clitoris; heat, ſharpneſs and difficulty of urine, pain in coition; it makes its progreſs ſooner. If the gonorrhœa is inveterate, it is very like a fluor albus.

Beſides arterial blood, the menſes conſiſt of redundant lymph or ſerum, chiefly from the membranous cells, and ventricles of the glands of thoſe parts of the membrana celluloſa which are more immediately connected with the kidneys, uterus, and ovarium. When this lymphatic ſecretion becomes morbid, it is called the fluor albus. At firſt the parts of the membrana adipoſa of the loins, kidneys, and uterine appendages, are waſted by it; but at length the flux becomes acrimonious, and may melt and carry off all the fat of the body.

The fluor albus ſometimes is diſcharged from the uterine veſſels, and ſometimes from the glands of the vagina: in the firſt caſe it ſtops when the menſes begin to flow; in the latter it continues with them, and pregnant women are not exempted from it.

When this flux is unſeaſonably ſtopped, it cauſes the belly to ſwell, with pains of the loins, ſlow fevers, numbneſs of the joints, and great laſſitude of the body.

When the flux is lacteous, it may be cured in fifteen days. The patient muſt feed ſparingly, uſe frequent exerciſe, and ſleep little. If this is not complied with, ſhe muſt bleed in the arm once or twice a-month, and take purges and emetics, or at leaſt frequent clyſters. The efficacy muſt be aſſiſted with diaphoretics, decoction of the woods, and diuretics.

In the ſemilacteous flux, inſpiſſating and nouriſhing diet will be beſt, ſuch as creams, ſoaps, boiled milk, roaſt meat, jellies, *&c.* milk, or milk turned with a decoction of china, is very good.

Narcotics are highly uſeful, eſpecially if the patient is reſtleſs, or delirious. In the beginning the doſe muſt be ſmall, which may be gradually increaſed.

When the veſiculæ lacteæ are relaxed, the tone muſt be reſtored with hot mineral baths, fomentations and injections of and bathing in the ſame. The ſtream may alſo be conveyed into the vagina with a funnel.

Decoctions of the woods are alſo good as diaphoretics; and diuretics of a decoction of roots of eringo and reſtharrow, with powder of millepedes, or glauber's ſalt.

If the lymphatic flux is attended with a ſcrophulous, ſcorbutic, or venereal taint, theſe diſorders muſt be firſt removed. If the uterine lymphatics are compreſſed by ſcirrhoſities, cancers, ganglions, or the like, regard muſt be had to the cauſes,

In obſtructions of the glands of the uterus, begin with bleeding; then a gentle purge, or an emetic of iij grains of tartar emetic or ipecacuanha. Afterwards, if the patient's conſtitution is cold, attenuating aperients. If ſhe is hot and bilious, with a ſenſible pain in the uterus, cooling broths and apozems, with the addition of crayfiſh; aſſes milk, with a decoction of barley; chalybeate whey, with chervil boiled therein. Gently purging mineral waters, baths, and half baths, are convenient in the ſummer.

Of the Furor Uterinus.

Salacity in women, attended with impudence, reſtleſſneſs, and a delirium, is called the *furor uterinus*.

It ariſes from a too great ſenſibility or inflammation of the pudenda, or parts wherein the venereal ſtimulus reſides, which are chiefly the clitoris and vagina; or the too great abundance and acrimony of the fluids of thoſe parts; or both theſe cauſes may exiſt together.

In the delirium maniacum, the patient is entirely ſhameleſs; in the melancholicum more reſerved, and her folly is confined to fewer objects.

It may proceed from the abuſe of hot aperitives; thus ſal amoniac, borax, and cantharides, have produced it: from powerful emenagogues in hot and bilious conſtitutions; ſometimes from difficult and ſuppreſſed menſes; from remedies given againſt ſterility. Muſk diſſolved in oleum aromaticum, and rubbed on the membrum virile, has raiſed a phlogoſis in the vagina, whence a furor uterinus enſued.

It is difficult to cure in thoſe whoſe menſes are difficult at firſt; in inveterate caſes; in old ſubjects. It is eaſier cured, when the furor uterinus is eſſential, and the delirium ſymptomatic, than when the delirium is eſſential, and the furor ſymptomatic. The maniacal delirium is harder to manage than the melancholic. If it continues a month or two, the fault of the brain becomes obſtinate, for it degenerates into real madneſs.

The indications of cure, are to diminiſh the heat and ſenſibility of the affected parts; to cool, ſweeten, and dilute the blood, and to render it balſamic; or to purſue both intenſions at once.

The firſt indication is anſwered by frequent and copious bleedings, as in an incipent madneſs; even to eight times in

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in two days, if nothing forbids; if ſhe faints, there is no danger. She muſt likewiſe be purged, as mad folks are, with jalap, ſcammony, diagrid. The doſe muſt be increaſed one third, as being hard to purge. Emetics are alſo good; for they evacuate the bile, which abates the acrimony of the humours. In the intervals, order frequent emollient clyſters; to which add half a dram of ſal prunella, or a little vinegar morning and night, baths and ſemicupia; moderate the heat, irritation, and ſenſibility of the parts affected: as alſo emollient injections into the vagina, and fomentations, or peſſaries of cotton may be ſteeped therein; ſal prunella may alſo be mixed therein.

Of an Inflammation *of the* Womb.

An inflammation of the uterus appears from extraordinary heat, and a fixed pain in the groin, with an acute fever, a pain in the loins and belly, an inflation of the abdomen, a ſtimulus to make water and go to ſtool; heat, and difficulty of urine; tumour, pain, heat, and tenſion of the hypogaſtric region; redneſs of the os uteri, and great heat of the vagina. If the fore-part of the uterus is affected, there is a dyſury or heat of urine; if the back part, a teneſmus, frequent faintings and cardialgia, a burning fever; or, if the inflammation is violent, a lypyria, in which the external parts or extremities are cold, and the internal burn, and the pulſe is imperceptible; a delirium and phrenſy: the breaſts ſwell in proportion as the inflamed uterus.

This diſeaſe may be ſaid to be ſuperficial or more grievous and profound It is eaſy formed in child-bed women, and frequently accompanies the milk-fever; and may be cured in a few days, if rightly managed: But when it is very intenſe, and attended with grievous ſymptoms without remiſſion, it kills on the ſeventh, ninth, or eleventh day; and a white miliary fever generally ſupervenes, which is the worſt omen, for it ſhews a mortification of the uterus. When this fever happens, there are ſpaſtic and painful ſtrictures in the abdomen, the flux of the uterus is ſtopped, the body is coſtive, the feet are cold; there is an urging to make water, which is painful; the head looks red, and ſwells; the eyes ſhine; drops of blood fall from the noſe; the mind is diſturbed; the ſleep is little, with terrifying dreams: there is likewiſe moſt difficult breathing, faintings, convulſions, a phrenetic delirium, which commonly have a fatal tendency.

This diſeaſe ſhould be diſtinguiſhed from an inflammation of the bladder or rectum; which may be done from the place of the pain: in that of the bladder it is ſuperficial, as if it were in the integuments; in that of the rectum it is very deep, as if about the os ſacrum; in that of the uterus it is in the middle, with a violent heat in the vagina, if the finger is introduced. If the bladder is affected, there is an extraordinary heat and retention of urine; and a teneſmus, if in the rectum: In the bladder; the pain is preciſely on the os pubis; in the rectum, the anus is affected. If theſe ſymptoms happen in an inflammation of the uterus, they are more ſlight.

If the inflammation is not reſolved, it generally ends in a mortification, ulcer, or cancer. A mortification ſoon kills, and the womb and vagina after a diſſection appear to be of a blackiſh brown. If it ends in a ſuppuration, the diſeaſe is of longer date, which generally happens to women not in child bed: It begins to diſcover itſelf about the ninth or tenth day, by the ceſſation of moſt of the inflammatory ſymptoms, which will return about the twelfth with a ſhooting pain in the affected part.

A gangrene or mortification happens on the fourth or fifth day, and is known by a weak, languiſhing, and intermitting pulſe, and by a ſudden ceſſation of all the ſymptoms.

If the diſeaſe exceeds the time of the former terminations, and the inflammation is ſuperficial, it is apt to turn to an induration or ſcirrhus; which ulcerating, becomes a cancer, and is incurable. If, about the twenty ſecond day, there is a renitency or hardneſs, and a dull heavy pain in the region of the uterus, there is a ſcirrhus formed.

Women in child-bed ſometimes have the womb inflamed from the fault of unſkilful midwives, or hard labour; or the lochia are ſtopped by pains, or hyſterical ſpaſms, dread, or cold; wherefore proper precautions ſhould be uſed to prevent it; which may done by keeping them under a gentle diaphoretic regimen, and by allaying the almoſt febrile heat. Oil of almonds is proper alone, or with a fourth part of ſperma ceti, given daily to half an ounce in chicken-broth; externally the whole abdomen ſhould be anointed with oil of dill, camomile and white-lilies, of each an ounce, oil of caraways a dram, or a dram of camphor; laying a warm napkin doubled over the ſame.

The tumult being thus appeaſed, the lochia are to be promoted with pills of bitter extracts, temperate reſinous gums, and aloes well corrected, of which xv gr. is a doſe morning and evening, to be continued from five to eight days. Theſe are alſo good when the after-birth or part of it is retained.

If there is a fever, the belly is diſtended with wind, the lochia are retained, and the ſpaſms tend to the upper parts, you muſt bleed in the foot.

The drink may be chicken-broth, with ſcorzonera-root, ſuccory, and ſhavings of hartſhorn boiled therein. As alſo temperating and reſolving powders made of crabs-eyes, and their ſolution, nitre, and ſal polychreſt. To which may be added clyſters of whey, camomile-flowers, mug-wort, ſage, *&c.* with honey, nitre, and fat of hens.

In women out of child-bed the inflammation generally happens in the neck of the uterus and the vagina; and then, beſides the foregoing things, you muſt apply epithems to the pubes, uterine injections, peſſaries, and ſuppoſitories. The epithem may be of arquebuſade water four ounces, eſſence of ſaffron, camphorated ſpirit of wine, of each two ounces, nitre a dram, diſſolved in elder-flower water; and, as circumſtances require, mixed with vinegar, or rue, or ſcordium, and applied with a double cloth. The injection may conſiſt of aſſes milk, with flowers of elder, myrrh, and ſaffron; and a little nitre may be added to the decoction. The teneſmus may be appeaſed with emollient half baths, or with an ounce of oil of ſweet almonds, and xij grains of ſaffron, injected into the anus. Theſe remedies are uſeful in caſe of a ſuppuration.

Of the Abscess *of the* Womb.

Abscesses of the womb are either inflammatory, tuberculous, or ſteatomatous.

The ſymptoms of an incipient abſceſs are much the ſame as the inflammation, ſuch as pain, heat, tenſion, *&c.* which intermit for ſome time, and appear again, when the ſuppuration begins; of which the inflammatory is moſt ſenſible, the ſteatomatous the leaſt. When the abſceſs is formed, all the ſymptoms of inflammation vaniſh: but coldneſs of the extremities, a ſlow fever, and maraſmus, gradually increaſe from the abſorption of the pus into the blood.

If no inflammation has preceded, and the patient was ſubject to obſtructions, eſpecially of the glands of the uterus, and had a lymphatic fluor albus, it may be tuberculous; if the tumour is ſoft and indolent, it may be ſteatomatous; but theſe are rare. The place may be partly diſcovered by the touch, but more eſpecially by the complaints of the patients.

If it breaks into the bladder, and paſſes off by urine, or into the rectum, and is diſcharged by ſtool, or into the groin, it is dangerous; if into the abdomen, incurable: If it breaks into the vagina, it may become an ulcer, which is commonly mortal; or the patient may periſh by a hectic fever before the eruption. The tuberculous and ſteatomatous are much the ſloweſt.

The work in this caſe muſt be left to nature, in a confirmed abſceſs: unleſs it can be come at through the vagina, and opened with a lancet, and then deterſive injections may perform a cure.

Of the Ulcer *of the* Uterus.

An ulcer may have its iſſue and ſeat in the concave ſurface of the uterus; or may be lodged more deep, and have iſſues into the rectum, bladder, groin, or cavity of the abdomen.

The cauſes of an eroſion may be the fluor albus, or rather lymphaticus; the corruption of the fœtus, or placenta, in the womb; acrid or cauſtic injections; the frequent uſe of cantharides, the lues venerea, or acrimonious menſes.

If the ulcer proceeds from an abſceſs, it may be inflammatory, tuberculous, or ſteatomatous; if from an eroſion, it may be venereal, ſcorbutic, ſcrophulous, or ſimple: It may be alſo ſimple, ſcirrhous, or cancerous.

The chief ſign of an ulcer is the efflux of purulent matter; and the greater the quantity, the profounder the ulcer. If the flux is ſanious, or mixed with blood, the blood-veſſels are eroded. Mortal hæmorrhages ſometimes ſupervene. Sometimes they may proceed from a fever, and rarefaction of the blood.

An ulcer is hard to be diſtinguiſhed from a fluor albus: however pus is always more compact and fetid, unleſs it is lymphatic; and there is always a fixed pain from an ulcer.

All ulcers of the uterus are dangerous; when they are fiſtulous, or ſcirrhous, or both, they portend death: the ſame may be ſaid of the cancerous; or when they are attended with a ſlow hectic fever, ſwellings of the feet, a maraſmus, *&c.*

In order to the cure, it is neceſſary to know whether the ulcer is ſeated in the body of the uterus, or near the os uteri, in the vagina; or whether it be venereal, for the laſt muſt be treated as that diſtemper requires.

To correct the vicious acrimony of the blood, uſe broths, or decoctions of lettuce, ſuccory, borrage, with ſal prunella; ſometimes with veal or a pullet; alſo chalybeated whey, ſweetened with ſyrup of violets. But the beſt thing is a milk-diet; to which, for variety-ſake, may be added rice, eggs, a decoction of china, barley, *&c* or chervil, agrimony, fumitory, or the ſecond lime-water, or ſteel-waters alone. Likewiſe emollient baths or ſemicupia.

Injections of whey and brown ſugar are good.

To conſolidate the ulcer, uſe injections of agrimony, with the ſecond lime water; or warm ſulphureous bath-waters, and the fumigations of the gums.

To eaſe the pain give gentle narcotics.

Of the Scirrhus *of the* Uterus.

Sometimes an inflammation of the uterus ends in a ſcirrhus, which is a hard, renitent, and indolent tumour, without heat and pain.

It is a very troubleſome diſorder, and often incurable, and the attempt to remove it is dangerous, though it is apt to bring on dropſies, a cancer, a maraſmus, *&c.* Its ſeat is in the glands, lymphatic veſſels, or lacteals of the uterus.

The ſymptoms are, a weight in the hypogaſtrium, when the patient ſtands or walks; difficulty of lying on the well ſide; if the tumour is painful, ſhe is obliged to lie on her back; the menſes are ſuppreſſed ſometimes there are violent and dangerous hæmorrhages; a dropſy of the abdomen or uterus: If it ſuppurates, there are ſigns of an abſceſs. It may be partly diſcovered by preſſing the hand on the region of the os pubis.

If the tumour be ſmall, recent, and void of pain, you may give broths of eringo, reſt-harrow, and aſparagus roots, of each half an ounce. Whey, with vitriolate tartar, or chalybeated whey, are very gentle. Or give a pint every day of vitriolic waters, for two or three months.

If theſe heat too much, ſhe muſt drink aſſes or goats milk. This is a palliative cure. But, to diſſolve the ſcirrhous matter, the patient muſt uſe baths, and half baths, of emollient decoctions. Emollient injections and moderate clyſters are very beneficial.

When heat, pain, and tenſion of the uterus are perceived, forbear deobſtruents, and bleed. Uſe no aperitives at the time of purging. At other times uſe diluents and narcotics. If the tumour does not diminiſh, leave theſe medicines off, and have recourſe to the palliative cure.

Of the Cancer *of the* Uterus.

A Cancer is a ſcirrhus become exquiſitely painful. When there is a darting or lancinating pain in the ſcirrhus, and in fifteen days or a month it becomes much larger than it was before, and ſcabrous, that is, angular and rugged; and the ſkin that covers it is ſmoother, till a fiſſure appears; the lips of which are retorted, and an ichor or acrimonious ſeroſity proceeds therefrom, with

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with a ſoft fungous fleſh about the fiſſure; you have the progreſs to a confirmed cancer. The matter never becomes pus.

An ulcer of the uterus reſembles a cancer, when a putrid ſanies iſſues from the corrupted ſubſtance of the womb, with great ſtench, exquiſite pain, and grievous ſymptoms. This diſeaſe is almoſt incurable.

The principal ſymptom of a cancer is pain, which is attended with reſtleſſneſs, watching, indigeſtion: which produce a ſlow fever, conſumption, maraſmus, and the like.

A hard, renitent, painful tumour, preceded by an indolent ſcirrhus, plainly evinces the exiſtence of a cancer. If nothing is diſcharged by the uterus, but a limpid, pellucid lymph, it is an occult cancer; if acrid ſerum, or ichor, it is open.

There is nothing to be done in this caſe, but by demulcents and lenients. If there is any hope of cure, it muſt be placed in aſſes milk, the Selters waters, and in bathing in ſoft water wherein wheat-bran has been boiled; in which the patient muſt ſit for an hour, or longer. She muſt abſtain from all ſharp, acrid, ſtimulating, and heating things.

Of the Procidentia Uteri.

It is a common diſorder; and the uterus preſents itſelf in the vagina between the labia, or is quite viſible. Sometimes it is only the internal membrane of the vagina, ſometimes the body of the womb.

This diſorder is rarely dangerous, for women bear it a long time.

The cure conſiſts in reducing the uterus, and retaining it in its place. To reduce it, order a ſimple clyſter to evacuate the rectum; the patient ſhould alſo bleed three or four times: Then emollient cataplaſms ſhould be uſed of white bread and milk, or of emollient plants; emollient baths are alſo to be employed. The parts being thus relaxed, the patient muſt lie on her back, with her hips higher than her head, and her legs quite aſunder; then put back the uterus by degrees, where you find the leaſt reſiſtance, and without any violence. This done, the patient muſt be confined to her bed for about fifteen days, with her thighs cloſed, or her legs acroſs, and her hips raiſed.

The cure muſt be compleated with aſtringent injections, baths, and peſſaries; with fumigations of frankincenſe, red roſes, and maſtich.

For Abortions, *For* Child-birth, } ſee Midwifery.

Of CHILDRENS DISEASES.

Of Diſorders *from a* Retention *of the* Meconium.

Infants newly born, from a retention of the meconium and other ſordid matter in the *primæ viæ*, are ſubject to gripings or pains in the belly, which produce conſtant crying, hiccups, the jaundice, wakefulneſs, reſtleſſneſs, ſtartings, frights, convulſions, and epilepſies; which, unleſs timely prevented, are fatal.

To carry this off, infants ſhould ſuck the firſt milk of their mother, if they give ſuck; otherwiſe they ſhould faſt ten or twelve hours; or take the following mixture, which will ſoften it:

Take 6 drams of freſh milk whey, and one dram of honey; make them into a draught.

Heiſter adviſes a grain or two of the powder of jalap, or two or three of rhubarb in ſyrup of roſes ſolutive, or a ſolution of manna; ſome give half an ounce of oil of ſweet almonds, with a little barley ſugar. A grain of aurum fulminans is the ſureſt remedy.

Of Diſorders *from* Coſtiveneſs *and* Wind.

If after ſome time the excrements become hard, with coſtiveneſs and a retention of wind, they will cauſe the ſymptoms abovementioned. In this the ſame remedies may be uſed, till the child's belly is open, and the acid or corrupted milk ſhould be corrected with abſorbent and teſtaceous powders; whereof half a ſcruple is a doſe. Harris believes an acid to be ſo predominant in infants, as to cauſe all their diſeaſes. Boerhaave affirms, if abſorbents are uſeful at any time, they muſt be in theſe caſes, and orders vij grains of the teſtaceous powders three times a day.

The nurſe muſt forbear to feed upon any thing that is ſour or acid.

Of Watching, *or* Want *of* Sleep.

Want of ſleep proceeds from the gripes, or coſtiveneſs, and wind and pain occaſion edthereby: we judge of the health of children by their ſleeping quietly, and of their illneſs by their watching, crying and ſcreaming. Watching may proceed from the milk being corrupted in the ſtomach, or from coſtiveneſs, or from wind.

In this diſorder the body ſhould be always kept open, firſt by a clyſter, and then a purge; and the abſorbents are to be given, and carminatives, particularly powder of aniſeed; and the belly is to be anointed with carminative oil. Soon after the purge, give two drams of oil of almonds. The nurſes ſhould avoid acid and flatulent things, and catching cold. Opiates, diaſcordium, and theriaca, muſt never be uſed, unleſs in caſes of extreme neceſſity.

Of the Aphthæ, *or* Thruſh.

The aphthæ are little whitiſh ulcers affecting the whole ſuperficies of the mouth, that is, the lips, gums, checks, tongue, palate, and fauces; nay, they even deſcend through the œſophagus to the ſtomach and inteſtines, and to the anus; but then they are very dangerous, and commonly put a period to the infant's life

Boerhaave ſays, if the aphthæ are of a pearl-colour, pellucid, white, few in number, ſuperficial, ſoft, and fall off eaſily, apt to return in part, they are of the beſt ſort; but if they are white or opake, like bacon, yellow, brown, black, thick, denſe, running together, hard, tenacious, conſtantly reſtored, corroſive, they are bad.

Harris believes gargles to be of little ſervice, becauſe infants cannot uſe them, inaſmuch as they ſwallow every thing that is put into their mouths. He therefore relies for a cure on the teſtaceous powders, and the moſt gentle cathartics, and believes them ſufficient,

Allen ſays the decoction of elm-bark is the beſt gargariſm for the cure of the aphthæ.

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This diſeaſe often attacks ADULTS in acute diſeaſes and inflammation of the viſcera. Boerhaave obſerves they are moſt common among the northern people, that inhabit low marſhy places, and often attend a continual putrid fever, or an intermittent becoming continual; and that they are uſhered in with a diarrhœa, or a dyſentery, a naufea, vomiting, loſe of appetite, great anxiety about the præcordia often returning, ſome great evacuation of the fluids, a ſtupor and dulneſs, ſleepineſs, a perpetual complaint of weight about the ſtomach.

To cure this diſtemper, hot, diluting, reſolvent, and detergent medicines muſt be given, that the cruſt may be diſpoſed to fall off eaſily.

Huxham adviſes, when the aphthæ ſupervene in fevers, to uſe gargles frequently of emollients and detergents, made with figs, hydromel, decoction of turnips, *&c.* To give rhubarb inwardly, chiefly if the patient is griped and looſe, adding an aromatic aſtringent with abſorbents.

Of GALLING *and* EXCORIATION.

THERE is often an excoriation of the parts near the pudenda, chiefly of the groin and ſcrotum; in the wrinkles of the neck, under the arms, and in other places, proceeding from the acrimony of the urine and ſweat. From this proceed itching pains, crying, watching, and reſtleſſneſs.

To remedy this, the parts affected may be waſhed often with warm water, and ſprinkled with drying powders, ſuch as chalk, burnt hartſhorn; but eſpecially tutty, and ceruſs, which may be tied cloſely in a rag, and the powders ſhook out on the diſordered places,

If the parts affected are more ſore, and tend to a real ulceration, it will be proper to add a little ſaccharum ſaturne to the powders. Likewiſe a little white vitriol diſſolved in ſpring water, and daubed upon the part, will dry and heal it very powerfully.

Of the STOPPAGE *of the* NOSE.

THE noſtrils of infants are often plugged up with a groſs mucus, inſomuch that they can ſcarce breathe, or ſuck, or ſwallow; which renders them very unquiet and uneaſy. To cure it, after a ſuitable purge, diſſolve two or three grains of white vitriol in half an ounce of marjoram water; then filtre it, and apply it now and then to the noſtrils with a linen rag.

Or you may apply oil of ſweet almonds, impregnated with the oil of marjoram, to the bottom and ſides of the noſtrils, which will reſolve the filth, and render the reſpiration free.

Of the SCABBY ERUPTIONS *and* CRUSTA LACTEA.

THE heads of children are often troubled with achores or ſcabby eruptions; and if the face is affected with them, they are called cruſta lactea. Theſe are expelled by the benefit of nature; and, before the eruption, the infant is often troubled with epileptic fits from the irritation of the morbific matter.

If the humours ſtrike in, either ſpontaneouſly or by improper applications, or if the exanthemata are of a blackiſh colour, they are very dangerous, and the infant generally falls into an aſthma or a fatal epilepſy.

In the cure, externals, and eſpecially ſuch as are repellent, ſhould be avoided; and things ſhould be given inwardly which correct and temperate the blood, and expel the noxious matter by a diaphoreſis. After the *primæ viæ* are purged, both the nurſe and child ſhould take alexipharmics in the morning, and the teſtaceous powders with calx of antimony, amber, and cinnabar, in the afternoon.

Externally, nothing of ſulphur or mercury ſhould be applied, or repellent lotions, or any thing cold To mollify the ſcabs, freſh butter, or calves marrow, or cream, are ſufficient. This caſe often proves obſtinate; and then the nurſe ſhould obſerve a ſtrict regimen, uſe good diet, take ſweeteners of the blood, and purgatives now and then.

Of a DIARRHOEA *and* VOMITING.

THE diarrhœa of infants is not to be ſtopped, either with aſtringents or narcotics: For aſtringents turn the flux of ſharp humours towards the noble parts, and endanger the life of the child; and, though narcotics appeaſe the ferocity of the turgeſcent humour for a time, yet they afterwards break out with greater force. Beſides, opiates are too powerful for the tender conſtitution of infants, and muſt not be given at all, or with the utmoſt caution. In ſlight caſes, diaſcordium may be ventured upon, to five or ſix grains; but, if there is a fever, it cannot be given without danger.

Therefore the beſt way is to give chalk, coral, pearls, and the like, of which about half a ſcruple is a doſe; which will abate the orgaſm of the humours, without kindling any new heat: after which the cure may be compleated with rhubarb, from ſix grains to half a ſcruple, in ſolutive ſyrup of roſes.

With regard to VOMITING, if there is great plenty of ſerous and noxious humours in the ſtomach, inſomuch that the ſtomach can retain nothing, if the child is a year or two old, he may ſafely take ſome grains of ipecacuanha; Harris ſays XV: but ſurely a third part of that quantity, nay, one or two grains, may be ſufficient; for this does not require the ſwallowing ſo much liquor after it as ſome others; and yet clears the ſtomach of crudities, viſcidities, and other bad humours.

Of Difficult BREEDING *the* TEETH.

AMONG all the diſorders which afflict children, there are none that generate ſuch grievous ſymptoms as difficult dentition. About five or ſix months after birth, the teeth generally begin to make their appearance; firſt the inciſores, or fore-teeth; next the canini, or dog-teeth; and laſtly, the molares, or grinders. About the ſeventh year there comes a new ſet; and at twenty-one the two inner grinders, called dentes ſapientiæ.

At the time of cutting their teeth, they ſlaver very much, and have a diarrhœa, which is no bad ſign; but when it is difficult, eſpecially when the canine teeth begin to be in motion, and to make their out-way out through the gums, the child has ſtartings in his ſleep, tumours of the gums, gripes, inquietude, watchings, a looſeneſs or coſtiveneſs, greeniſh ſtools, the thruſh, fevers, difficult breathing, ſuffocating catarrhs, convulſions, epilepſies, which often end in death.

It

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It ſhews dentition is like to be bad, if the child is perpetually crying, thruſts his fingers into his mouth, and bites the nurſe's nipples; if unequal tubercles are perceived in the gums, both by the ſight and touch, where the teeth are expected to appear: if there is heat in the mouth and the whole body; if they ſtart without a cauſe, eſpecially in ſleep. Theſe do not come on without great ſlavering, and ſometimes a diarrhœa, as was mentioned above.

Harris obſerves, that when an inflammation appears, the phyſician will labour in vain, if the cure is not begun with applying a leech under each ear. When the ſwelling of the gums ſhews it is time to cut it, to make way for the tooth; he would have it done with a penknife, not with a fine lancet, leſt the wound ſhould heal, and form a cicatrix. The food he directs to be no more than luke-warm.

Heiſter internally adviſes aqueous mixtures, temperating powders; externally, oil of ſweet almonds, with ſyrup of violets, or ſyrup of wild poppies, lightly acidulated with ſpirit of vitriol, wherewith often to rub the gums; as alſo with the coral or other ſmooth things, which will have the ſame effect.

Morgan affirms in this caſe, it will be beſt to abate the effervescence of the blood with diluters; to appeaſe the pain with gentle opiates; to open the body with purges and clyſters; to draw off the fermented ſerum by bliſters; to promote the cutting of the teeth by cooling, relaxing, and opening the gums; for this purpoſe diacodium is good; or a ſtrong decoction of marſh-mallows and poppy-heads, in thick milk, cream, or neats-foot oil: Theſe take off the heat, and aſſwage the pain.

Of the RICKETS.

CHILDREN are ſeldom attacked with rickets before they are nine months, and after they are two years old; but it frequently happens in the intermediate ſpace between theſe two periods. It may proceed originally from the diſorders of the parents, and may be increaſed by thoſe of the nurſe.

It is likewiſe promoted by feeding the child with aqueous and mucous ſubſtances, crude ſummer-fruits, fiſh; by unleavened farinaceous aliment, and too great a quantity of ſweet things; by an intermittent autumnal ague, or other chronic or acute diſorders; by a ſtriking in of the itch or herpes; by the ſuppreſſion or injudicious cure of ulcers; by being enervated with baths, fomentations, ointments, or moiſt vapours; by continual reſt in a perforated chair, with his coats up.

This diſorder is known, in thoſe who cannot walk, from the cauſes preceding; from his brothers or ſiſters having the ſame diſeaſe; from a flaccid tumour of the head and face; from a flabby looſe ſkin; from a ſwelling of the abdomen; from a falling away of the reſt of the parts, eſpecially of the muſcles; from protuberances of the epiphyſes of the joints, ſuch as the wriſts, ancles, knees, elbows, *&c.*; from the magnitude of the jugular veins and arteries, while the reſt decreaſe. The legs grow crooked.

In thoſe that have begun to walk, beſides the former ſigns, there is a ſlowneſs, debility, and tottering in his motion; which ſoon proceeds to a conſtant deſire of ſitting, and afterwards changes to lying down; inſomuch that nothing at laſt is moveable, but the neck and head. Add to theſe, an early wit, an underſtanding which exceeds his age, while the appetite and digeſtion continue unhurt.

As he grows older, his head is enlarged, with ample ſutures; his thorax is compreſſed on the ſides; and his ſternum riſes up ſharp, while the extremities of the ribs are knotty. The abdomen is protuberant, and the teeth black and carious. Theſe diſorders ſenſibly increaſing, are the cauſe ever after of pernicious diſeaſes of the ſame kind; principally a ſpina ventoſa, and a caries of the bones.

In the mean while a ſlow feveriſh diſorder preys upon the whole body, till the time of death; and then all the fibres, veſſels, and viſcera appear to be ſoft, flaccid, and the fluids diſſolved and mucous.

The cure is to be attempted with light, nouriſhing, dry aliment, not fat, but ſeaſoned, and taken often: With a little ſound drink, ſuch as beer, not ſtale, but well boiled and fine: With a dry warm air, and dry warm woolen cloathing: With being carried about in the arms, and often ſhook, ſwung, and put in motion: With being drawn in a vehicle over the ſtones: With repeated frictions with warm dry flannel, ſprinkled with aromatics; eſpecially the abdomen and ſpine of the back: With prudently repeated bliſters, with ſtrengthening purges, for ſeveral days ſucceſſively: As alſo by the continued uſe of ſtrengthening, drying, antiſcorbutic remedies, and ſuch as raiſe the ſpirits.

Particularly for food, the bread ſhould be biſcuit, with a little ſaffron and ſpices. The fleſh ſhould be pigeons, pullets, veal, rabbets, mutton, gently roaſted, minced, and mixed with biſcuit, ſalt, a little parſley, thyme, nutmeg, or the like.

Likewiſe rice, millet, pearl-barley, boiled with raiſins; to which add a little wine and ſpice. The drink may be generous French red wine, of which give an ounce three or four times a-day.

MED

MEDICINES, whatever ſubſtances ſerve to reſtore health.

Medicines are either ſimple or compound: the former being formed by nature alone; and the latter owing to the induſtry of men, by variouſly mixing the ſimple ones together.

Medicines are likewiſe diſtinguiſhed, from the manner of uſing them, into internal or external; and with regard to their effects, they are ſaid to be aſtringent, cathartic, emetic, *&c.*

MED

Pocket-MEDICINES, in ſurgery, thoſe which a ſurgeon ought to carry always about him, in a box or convenient caſe.

Thoſe, according to Heiſter, are the common digeſtive ointment, and the brown or Egyptian ointment, for cleanſing and digeſting foul ulcers, and ſome vulnerary balſams, as the linimentum arcæi, or the balſam of Peru, of Gilead or Capivi, or the Samaritan balſam: to theſe muſt alſo be added a plaſter or two, as the

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diachylon, or ſtypticum Crollii, ſince one or other of theſe is almoſt conſtantly wanted. Neither ſhould there be wanting a piece of blue vitriol for the taking down luxuriant fleſh, and to ſtop hæmorrhages; but if vitriol is wanting, burnt alum, red precipitate, the infernal ſtone, or any other corroſive medicine, will ſupply its place in corroſive intentions, and the laſt will alſo ſerve to open abſceſſes, to make iſſues, and perform many other operations of that kind.

With theſe there ſhould always be kept in readineſs alſo a quantity of ſcraped lint, that the ſurgeon may be able to give immediate aſſiſtance to wounded perſons; ſince, if he is unprepared for this, they may eaſily be taken off by an hæmorrhage; a circumſtance which ought alſo to prevail with him to be always provided with ſuitable bandages.

MEDINA, a city of Arabia Deſerta, ſituated two hundred miles north-weſt of Mecca: in E. long. 40° 35′. N. lat. 24° 30′.

This is called the city of the prophet, on account of Mahomet's being received and protected by the inhabitant's on his flight hither from Mecca, where the Mahometan æra commences.

MEDITERRANEAN-SEA, extends from the ſtraits of Gibraltar to the coaſts of Syria and Paleſtine, being upwards of 2000 miles in length, but of a very unequal breadth: the weſt-part of it ſeparates Europe from Africa; and the Levant or eaſt-part of it divides Aſia from Africa.

MEDITULLIUM, is uſed by anatomiſts for that ſpungy ſubſtance between the two plates of the cranium, and in the interſtices of all laminated bones.

MEDIUM, in logic, the mean or middle term of a ſyllogiſm, being an argument, reaſon, or conſideration for which we affirm or deny any thing: or, it is the cauſe why the greater extreme is affirmed or denied of the leſs in the concluſion.

MEDIUM, in arithmetic, or *arithmetical* MEDIUM, or MEAN, that which is equally diſtant from each extreme, or which exceeds the leſſer extreme as much as it is exceeded by the greater, in reſpect of quantity not of proportion: thus 9 is a medium between 6 and 12.

MEDIUM, in philoſophy, that ſpace or region through which a body in motion paſſes to any point: thus air, is the medium wherein bodies move near our earth; water, the medium wherein fiſhes live and move; and glaſs is alſo a medium of light, as it affords it a free paſſage. That denſity or conſiſtence in the parts of the medium, whereby the motion of bodies in it is retarded, is called the reſiſtance of the medium; which together with the force of gravity, is the cauſe of the ceſſation of the motion of projectiles.

Subtile or *ætherial* MEDIUM. See ÆTHER.

MEDLAR, in botany. See MESPILUS.

MEDULLA, in anatomy. See ANATOMY, p. 147.

MEDULLA OBLONGATA. See ANATOMY, p. 287.

MEDULLA SPINALIS. See ANATOMY, p. 288.

MEDUSA, in zoology, a genus of inſects belonging to the order of moluſca. The body is gelatinous, roundiſh, and depreſſed; and the mouth is in the centre of the under part of the body. There are twelve ſpecies, all natives of the ſea.

MEDWAY, a river which riſes in Aſhdon foreſt in Suſſex; and running through Kent, is divided into two branches by the Iſle of Sheppy, one of which is called Eaſt Swale, and the other Weſt Swale.

MEISSEN, once the capital of the marquiſate of Miſſen or Miſnia, in Upper Saxony, on the river Elbe, ten miles north of Dreſden.

MELAMPODIUM, in botany, a genus of the ſyngenetia polygamia neceſſaria claſs. The receptacle is paleaceous and conical; the pappus conſiſts of one valve-ſhaped leaf, and the calix of five leaves. There are two ſpecies, both natives of Britain.

MELAMPYRUM, a genus of the didynamia angioſpermia claſs. The calix has four ſegments; the upper lip of the corolla is compreſſed, and bent back at the edge; and the capſule has two oblique cells, containing two gibbous ſeeds. There are five ſpecies, four of them natives of Britain, *viz* the criſtatum, or creſted cow-wheat; the arvenſe, or purple cow wheat; the pratenſe, or meadow cow-wheat; and the ſylvaticum, or yellow cow-wheat.

MELANCHOLY, in medicine, a kind of delirium, attended with gloomy thoughts, heavineſs, and ſorrow. See MEDICINE.

MELANTERIA, in natural hiſtory, a very beautiful foſſil of a denſe, compact, and regular texture, and of an extremely bright pale yellow, reſembling nothing ſo much as the pureſt gold: it is remarkably heavy, and is uſually found in little irregular maſſes of the bigneſs of a pigeon's egg, which are broken with a ſlight blow: but it is uſually met with in the form of a fine gold-coloured efflorence or vitriolic and pyritical bodies; or in looſe, ſhattery. and friable maſſes of a more duſky yellow; in which latter ſtate it ſo much reſembles a native ſulphur, that it is frequently miſtaken for one: however, it is not inflammable; but calcines in the fire to a greyiſh powder, which by burning longer changes to a deep and fine purple.

The Greeks uſed it externally, as a gentle eſcharotic and a ſtyptic: they made it an ingredient in their ointments for old ulcers, and uſed to ſprinkle the powder of it on freſh wounds to ſtop the hæmorrhage.

MELANTHIUM. in botany, a genus of the hexandria trigynia claſs. The corolla conſiſts of ſix petals; and the filaments are compoſed of the long ungues of the corolla. There are three ſpecies, none of them natives of Britain.

MELANURUS, in ichthyology, See SPARUS.

MELASTOMA, in botany, a genus of the decandria monogynia claſs. The calix is bell-ſhaped, and has four ſegments; the petals are five, inſerted into the calix; and the berry has five cells. There are twelve ſpecies, none of them natives of Britain.

MELCHITES, in church-hiſtory, the name given to the Syriac, Egyptian, and other Chriſtians of the Levant. The Melchites, excepting ſome few points of little or no importance, which relate only to ceremonies and eccleſiaſtical diſcipline, are in every reſpect profeſſed.

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profeſſed Greeks; but they are governed by a particular patriarch, who reſides at Damas, and aſſumes the title of patriarch of Antioch.

MELCHISEDECHIANS, in church-hiſtory, a ſect which aroſe about the beginning of the third century, and affirmed, that Melchiſedek was not a man, but a heavenly power, ſuperior to Jeſus Chriſt: for Melchiſedek, they ſaid, was the interceſſor and mediator of the angels; but Jeſus Chriſt was ſo only for men, and his prieſthood only a copy of that of Mechiſedek.

MELCOMB REGIS, a borough-town of Dorſetſhire, ſix miles ſouth of Dorcheſter. It ſends two members to parliament.

MELEAGRIS, the TURKEY, in ornithology. The head is covered with ſpongy caruncles; and there is likewiſe a membranaceous longitudinal caruncle on the throat. There are three ſpecies, *viz.* 1. The gallopavo, or North American turkey of Ray, has a caruncle both on the head and throat; and the breaſt of the male is bearded. He lives upon grain and inſects. When the cock ſtruts, he blows up his breaſt, ſpreads and erects his feathers, relaxes the caruncle on the forehead, and the naked parts of the face and neck become intenſely red. 2. The criſtata, or Braſilican pheaſant of Ray, has an erect creſt of feathers on the head, and violet-coloured temples: it has a caruncle on the throat, but none on the head. 5. The ſatyra, or horned pheaſant of Edwards, has two blue horns behind the eyes, a red body ſpotted with black and white. It is a native of Bengal.

MELES, in zoology. See URSUS.

MELIA, the BEAD TREE, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of 5 teeth, and the corolla of 5 petals; the nectarium is cylindrical, about the length of the corolla, and has ten teeth on the margin; and the drupa, which is ſhaped like an egg, has five cells. There are two ſpecies, none of them natives of Britain.

MELIANTHUS, in botany, a genus of the didynamia angioſpermia claſs. The calix conſiſts of five leaves; and the corolla of four petals, with a nectarium within the loweſt one; and the capſule has four cells. There are two ſpecies, both natives of Æthiopia.

MELICA, in botany, a genus of the triandria digynia claſs. The calix conſiſts of two valves, containing two flowers. There are three ſpecies, only one of which, *viz.* the nutans, or melic-graſs, is a native of Britain.

MELICERES, in ſurgery, a kind of encyſted tumours, ſo called when their contents are of the conſiſtence of honey.

MELILOT See TRIFOLIUM.

MELINDA, the capital of the province of the ſame name, and of all the Portugueſe ſettlements on the coaſt of Malabar, in Africa: E. long. 39°. S. lat. 3°.

MELINUM, in natural hiſtory, the name of an earth, famous in the earlieſt ages of painting, being the only white of the great painters of antiquity; and, according to Pliny's account, one of the three colours with which alone they performed all their works. It is a fine, white, marly earth, of a very compact texture, yet remarkably light; a ſort of texture which muſt render any earth fit for the painter's uſe, that is of a proper colour. It is frequently found forming a ſtratum in the earth, lying immediately under the vegetable mould. It is of a very ſmooth, but not gloſſy ſurface, is very ſoft to the touch, adheres firmly to the tonge, is eaſily broken between the fingers, and ſtains the ſkin in handling. It melts readily in the mouth, and is perfectly fine, leaving not the leaſt grittineſs between the teeth. Thrown into water, it makes a great bubbling and loud hiſſing noiſe, and moulders away into a fine powder. It does not ferment with acids, and ſuffers no change in the fire. Theſe are the characters by which the melinum of the ancients is diſtinguiſhed from all the other white earths. It is ſtill found in the ſame place from whence the painters of old had it; which is that from whence it has its name, the iſland of Milo, called Milos by the Greeks, and is common in moſt of the adjacent iſlands. It has been of late tried here as a paint, and is found not to make ſo bright a white as the other ſubſtances now in uſe among the painters; but ſeems not liable, like them, to turn yellow; and if ſo, would be worth the conſideration of perſons in the colour-trade, eſpecially as it may be had in any quantities for carriage.

MELISSA, in botany, a genus of the didynamia gymnoſpermia claſs. The calix is dry, and plain above; the upper lip of the corolla is vaulted and bifid: and the middle lobe of the under lip is cordated. There are eight ſpecies, two of which are natives of Britain, *viz.* the calamintha, or common calaminth; and the repeta, or field calaminth.

MELITENSIS TERRA, *earth of Malta*, an earth of which there are two very different kinds; the one of the genus of the boles, the other of the marles. The latter is that known by medicinal authors under this name; the former is the Malta earth now in uſe: but both being brought from the ſame place, are confuſedly called by the ſame name. The Malteſe marle, which is the terra Melitenſis of medicinal authors, is a looſe, crumbly, and very light earth, of an unequal and irregular texture, and, when expoſed to the weather, ſoon falls into fine ſoft powder; but when preſerved and dried, it becomes a looſe, light maſs, of a dirty white colour, with a greyiſh caſt: it is rough to the touch, adheres firmly to the tongue, is very eaſily crumbled to powder between the fingers, and ſtains the hands. Thrown into water, it ſwells, and afterwards moulders away into a fine powder. It ferments very violently with acid menſtruums.

Both kinds are found in great abundance in the iſland of Malta, and the latter has been much eſteemed as a remedy againſt the bites of venomous animals, but with how much juſtice we cannot ſay. The other has ſupplied its place in the German ſhops, and is uſed there as a cordial aſudorific, and aſtringent See BOLE.

MELITIS, in botany, a genus of the didynamia gymnoſpermia claſs. The calix is larger than the tube of the corolla; the upper lip of the corolla is plain; the under lip is crenated; and the antheræ are in the form of a croſs. There is but one ſpecies, *viz.* the meliſſophyllum, or baſtard baum.

MELLER, a large lake of Sweden, on the north ſide of which ſtands the capital city of Stockholm: it is eighty miles long and thirty broad.

MELOCHIA, a genus of the monadelphia pentandria claſs.

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claſs. It has five ſtyli; and the capſule has five cells, each containing one ſeed. There are ſix ſpecies, none of them natives of Britain.

MELODY, in muſick, the agreeable effect of different ſounds, ranged and diſpoſed in ſucceſſion; ſo that melody is the effect of a ſingle voice or inſtrument, by which it is diſtinguiſhed from harmony.

MELOE, in zoology, agenus of inſects of the order of coleoptera. The antennæ are jointed, the laſt joint being oval; the breaſt is roundiſh; the elytra are ſoft and flexible; and the head is inflected and gibbous. There are 16 ſpecies, principally diſtinguiſhed by their colour. The veſicatorius, or cantharis of the ſhops, when bruiſed, is univerſally uſed as a bliſtering plaſter.

MELON, in botany. See CUCUMIS.

MELOTHRIA, in botany, a genus of the triandria monogynia claſs. The calix conſiſts of five ſegments; the corolla is monopetalous and bell-ſhaped; and the berry has one cell, containing many ſeeds.

In Canada, Virginia, and Jamaica, where this fruit commonly grows, it is pickled for the table.

MELTING-CONE, in aſſaying. See CHEMISTRY, p. 113.

MEMBER, in architecture, denotes any part of a building; as, a frieze, cornich, or the like. This word is alſo ſometimes uſed for the moulding.

MEMBER *of parliament*. See PARLIAMENT.

MEMBERED, in heraldry, is where the legs or feet of an eagle, griffin, or other bird, are of a different colour from the reſt of the body.

MEMBRANE, in anatomy, a pliable texture of fibres interwoven together in the ſame plane. See ANAT. part I and II.

MEMECYLON, in botany, a genus of the octandria monogynia claſs, The calix is above the fruit, and has an entire margin; the corolla conſiſts of one petal; and the berry is crowned with a cylindrical calix. There is but one ſpecies, a native of Ceylon.

MEMOIRS, in matters of literature, a ſpecies of hiſtory, written by perſons who had ſome ſhare in the tranſactions they relate; anſwering to what the Romans called Commentarii.

MEMORY, a faculty of the human mind, whereby it retains and recals the ideas it has once perceived. See METAPHYSICS.

MEMPHIS, once the capital of Egypt, ſtood on the weſt ſide of the Nile, almoſt oppoſite to Grand Cairo.

MENDICANTS, or begging friers, ſeveral orders of religious in Popiſh countries, who, having no ſettled revenues, are ſupported by the charitable contributions they receive from others.

MENGRELIA, a province of Aſiatic Turky, ſituated on the north-eaſt part of the Euxine ſea, between Georgia and Circaſſia, where the Turks purchaſe boys and young women for their ſeraglios.

MENIALS, domeſtic or houſehold ſervants, who live under their lord or maſter's roof.

MENINGES, or MENYNGES, in anatomy, a name given to the dura and pia mater of the brain.

MENISCUS, in optics, a lens convex on one ſide, and concave on the other. See OPTICS.

MENISPEMUM, in botany, a genus of the dicœcia dodecandria claſs. The calix conſiſts of ſix leaves, and the corolla of ſix petals. It has three berries, containing each a kidney-ſhaped ſeed. There are ſeven ſpecies, none of them natives of britain.

MENNONITES, a ſect of baptiſts in Holland, ſo called from Mennon Simonis of Friezland, who lived in the ſixteenth century. This ſect believe, that the New Teſtament is the only rule of faith; that the terms Perſon and Trinity are not to be uſed in ſpeaking of the Father, Son, and Holy Ghoſt; that the firſt man was not created perfect; that it is unlawful to ſwear, or to wage war upon any occaſion; that infants are not the proper ſubjects of baptiſm; and that miniſters of the goſpel ought to receive no ſalary.

MENOLOGY, the Greek calendar, in which the lives of the ſaints in ſhort, or barely their names, are cited; anſwering nearly to the martyrology of the Latin church. See MARTYROLOGY

MENSA, in law-books, a term that includes in it all patrimony, and neceſſaries for livelihood.

MENSALS, in church-hiſtory, ſuch livings as were formerly united to the tables of religious houſes, and hence called menſal benefices

MENSES, FLOURS, COURSES, *Catamenia*, in medicine, the monthly evacuations from the uterus of women not with child and not giving ſuck. See MEDICINE.

MENSTRUUM, in chemiſtry, any body which in a fluid or ſubtiliſed ſtate is capable of interpoſing its ſmall parts betwixt the ſmall parts of other bodies, ſo as to divide them ſubtilely, and form a new uniform compound of the two. See CHEMISTRY.

MENSURATION, in general, denotes the act or art of meaſuring lines, ſuperficies, or ſolids. See GEOMETRY.

MENTHA, in botany, a genus of the didynamia gymnoſpermia claſs. The corolla conſiſts of four ſegments; and the ſtamina are erect and diſtant. There are 14 ſpecies, 11 of them natives of Britain, *viz.* the ſpicata, or ſpear-mint; the longifolia, or horſe-mint; the rotundifolia, or round leaved horſe-mint; the piperita, or pepper mint; the gentilis, or red-mint; the verticillata, or curled-mint; the arvenſis, or corn-mint; the exigua, or ſmooth-mint; the aquatica, or water-mint; the hirſuta, or round-headed mint; and the pulegium, or penny-royal.

MENTZ, the capital of one of the electorates of the ſame name in Germany, ſituated at the confluence of the rivers Rhine and Maine: E. long. 8°, and N. lat. 50°.

MENYANTHES, in botany, a genus of the pentandria monogynia claſs. The corolla is hairy; the ſtigma is bifid; and the capſule has but one cell. There are three ſpecies, two of which are natives of Britain, *viz.* the trifolia, or buck-bean; and the nymphoides, or fringed water lilly.

MEOTIS, or PALUS MEOTIS, a ſea of Turky, which divides Europe from Aſia, extending from Crim Tartary to the mouth of the river Don, or Tanais.

MERCATOR's SAILING, that performed by Mercator's chart. See NAVIGATION.

MER-

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Fig. 1. MANTILE

Fig. 3. MELEAGRIS
or Horned Pheasant

Fig. 2. MARTLETS

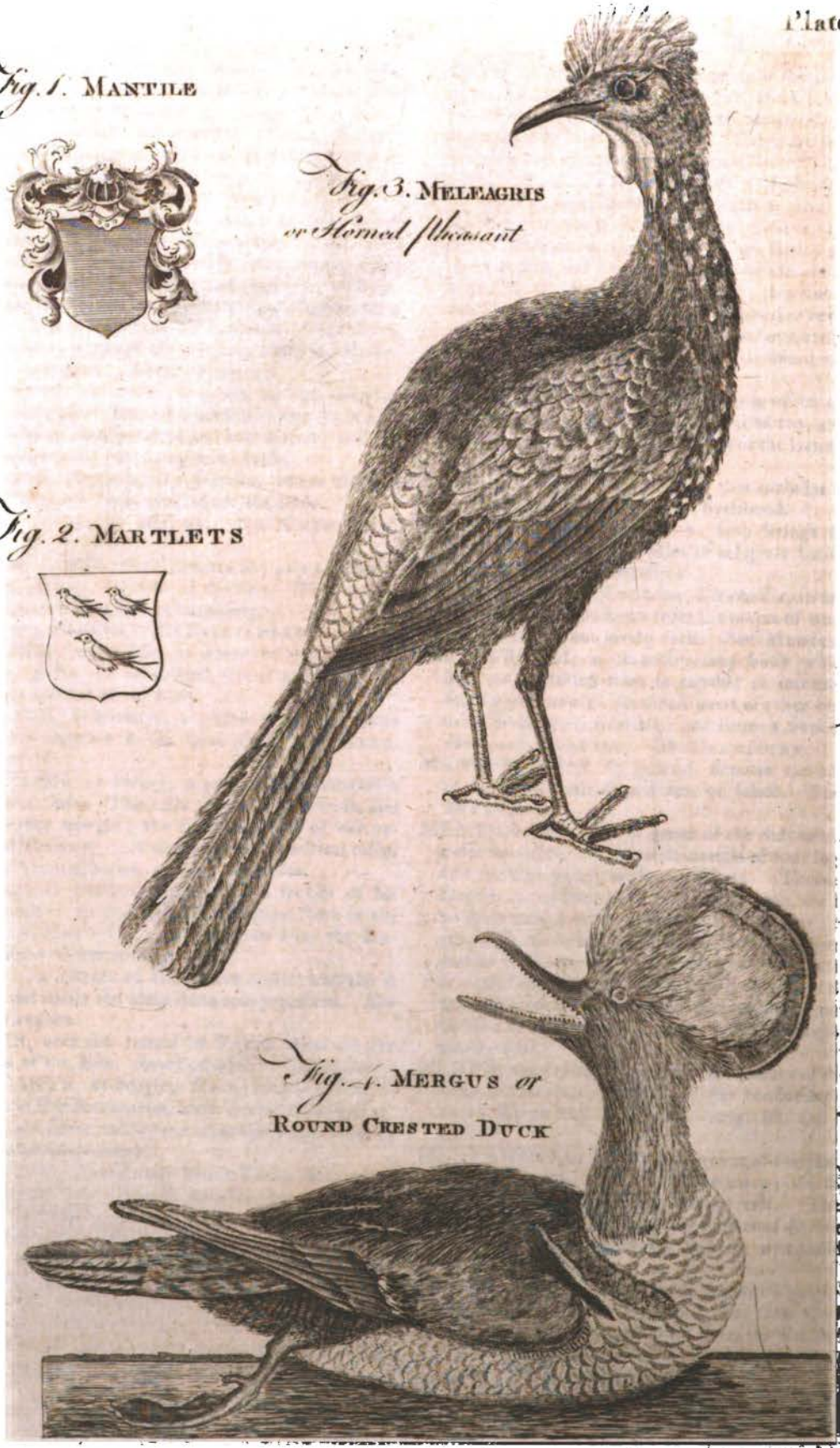

Fig. 4. MERGUS or
ROUND CRESTED DUCK

J. Bell Sculp.

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MERCHANT, a perſon who buys and ſells commodities in groſs, or deals in exchanges; or that traffics in the way of commerce, either by importation or exportation. See COMMERCE.

MERCURIAL, ſomething conſiſting of or relating to mercury.

MERCURIALIS, in botany, a genus of the dioecia enneandria claſs. The calix of both male and female conſiſts of three ſegments; neither of them have any corolla; the ſtamina are from nine to twelve; the antheræ are globular and didymous; the female has two ſtyli; and the capſule has two cells, and one ſeed in each. There are four ſpecies, two of them natives of Britain, *viz.* the perennis, or dogs mercury; and the annua, or French mercury.

MERCURY, in natural hiſtory. See CHEMISTRY, p. 85. and 137.

MERCURY, ☿, in aſtronomy. See ASTRONOMY, p. 436.

MERCURY, in heraldry, a term uſed, in blazoning by planets, for the purple colour in the arms of ſovereign princes.

MERCY-SEAT, in Jewiſh antiquity. See PROPITIATORY.

MERGUS, in ornithology, a genus of birds, of the order of the anſeres, diſtinguiſhed by having the beak of a cylindrical figure, and hooked at the extremity, and its denticulations of a ſubulated form. There are ſix ſpecies of this genus, *viz.* 1. The cucullatus, or creſted diver of Cateſby, has a globular creſt, white on each ſide; and the body is brown above, and white below. It is a native of America. *See Pl.* 110. 2. The merſanger, has a longitudinal creſt, ſomewhat erect, a white breaſt, and a black head. It is a native of Europe. 3. The ſerrator, has a hanging creſt, a variegated browniſh breaſt, and a white collar. It is a bird of Europe. 4. The caſter has a creſted aſh-coloured head, a white throat, and a black bill and legs. It inhabits the ſouth of Europe. 5. The albellus, has a hanging creſt, a black head and back, and white below. It is a bird of Europe. 6. The minutus, has a ſmooth gray head, with a black ſpot near the eyes. It is a native of Europe.

MERIDIAN. See GEOGRAPHY, and ASTRONOMY.

MERIONETHSHIRE, a county of north Wales, bounded by Caernarvon and Denbighſhire on the north, by Montgomeryſhire on the ſouth-eaſt, and by the Iriſh ſea on the weſt.

MERIT, ſignifies deſert. This term is more particularly uſed to ſignify the moral goodneſs of the actions of men, and the rewards to which thoſe actions intitle them.

MERLIN, in ornithology. See FALCO.

MERLON, in fortification, is that part of a parapet which is terminated by two embraſures of a battery.

MERNS, a county of Scotland, bounded by Mar on the north, by the German ocean on the eaſt, by Angus on the ſouth, and by Gowry on the weſt.

MEROPS, in ornithology, a genus belonging to the order of picæ. The bill is crooked, flat, and carinated; the tongue is jagged at the point; and the feet are of the walking kind. There ſix ſpecies, *viz.* 1. The apiaſter, or bee-eater, has an iron-coloured back; the belly and tail are of a bluiſh green; and the throat is yellow. It inhabits the ſouth of Europe. 2. The viridis, or Indian bee-eater, is green, with a black belt on the breaſt; and the throat and tail are black. 3. The congener is yellowiſh, with a green rump. It inhabits the ſouth of Europe. 4. The ſuperciliioſus, is green, with a white line both above and below the eyes, and a yellow throat. It is found in Madagaſcar. 5. The cinereus, is variegated with red and yellow, with the two longeſt quill-feathers of the tail red. It is a native of America. 6. The caſer is grey, with a a very long tail. It is a native of Æthiopia.

MERSE, a county of Scotland, bounded by Lothian on the north, by the German ocean on the eaſt, by Northumberland and Tiviotdale on the ſouth, and by Tweeddale on the weſt.

MERULA, in ornithology. See TURDUS.

MESEEN, the capital of a province of the ſame name, in Ruſſia: it is a port-town, ſituated on the coaſt of the White ſea, on hundred and fifty miles north eaſt of Archangel.

MESEMBRYANTHEMUM, in botany, a genus of the icoſandria pentagynia claſs. The calix conſiſts of five ſegments, and the corolla of numerous linear petals; and the capſule is fleſhy below the flower, and contains many ſeeds. There are 45 ſpecies, none of them natives of Britain.

MESENTERY, in anatomy. See ANATOMY, p. 262.

MESNE, in law, ſignifies him who is lord of a manor, and who hath tenants holding of him, yet himſelf holding of a ſuperior lord.

MESOCOLON, in anatomy. See ANATOMY, p. 262.

MESOLOGARITHMS, according to Kepler, are the logarithms of the co-ſines and co-tangents, the former of which were called by lord Napier antilogarithms, and the latter differentials.

MESOPOTAMIA, the ancient name of Diarbeck. See DIARBECK.

MESOPTERYGIUS, in ichthyology, a term applied to ſuch fiſhes as have only one back-fin, and that ſituated in the middle of the back.

MESPILUS, in botany, a genus of the icoſandria pentagynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; the berry is below the flower, and contains five ſeeds. There are ſeven ſpecies, only one of which, *viz.* the germanica, or medlar, is a native of Britain.

MESSASIPPI, or MESCHASIPPI, a country of North America, bounded by Canada on the north, the Britiſh plantations on the eaſt, the gulph of Mexico on the ſouth, and the province of New Mexico on the weſt.

MESSENGERS, are certain officers chiefly employed under the direction of the ſecretaries of ſtate, and always in readineſs to be ſent with all kinds of diſpatches foreign and domeſtic. They alſo, by virtue of the ſecretaries warrants, take up perſons for high treaſon, or other offences againſt the ſtate.

MESSIAH, the ANOINTED; a title which the Jews gave to their expected great deliverer, whoſe coming they ſtill wait for: and a name the Chriſtians apply to Je-

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ſus Chriſt, in whom the prophecies relating to the Meſſiah were accompliſhed.

MESUA, in botany, a genus of the polyandria monogynia claſs. The calix has four leaves; the corolla four petals; and the capſule has four valves, containing four ſeeds. There is but one ſpecies, a native of India.

METACARPUS, in anatomy. See ANATOMY, p. 181.

METALS, in natural hiſtory, are defined to be foſſile bodies, fuſible by fire, concreting again in the cold, and malleable, or diſtenſible and ductile under the hammer. See CHEMISTRY.

Semi-METALS, metallic foſſils, fuſible by fire, and not malleable in their pureſt ſtate. See CHEMISTRY.

METAL, in heraldry. There are two metals uſed in heraldry, by way of colours, *viz.* gold and ſilver, in blazon called *or* and *argent*.

In the common painting of arms theſe metals are repreſented by white and yellow, which are the natural colours of thoſe metals. In engraving, gold is expreſſed by dotting the coat, *&c.* all over; and ſilver, by leaving it quite blank.

It is a general rule in heraldry, never to place metal upon metal, nor colour upon colour; ſo that if the field be of one of the metals, the bearing muſt be of ſome colour; and if the field be of any colour, the bearing muſt be of one of the metals.

METALLURGY, comprehends the whole art of preparing and working metals, from the glebe, or ore, to the utenſile; in which ſenſe, aſſaying, ſmelting, refining, ſmithery, gilding, *&c.* are only branches of metallurgy.

METAMORPHOSIS, in general, denotes the changing of ſomething into a different form; in which ſenſe it includes the transformation of inſects. See NATURAL HISTORY.

METAPHOR, in rhetoric, a trope, by which we put a ſtrange word for a proper word, by reaſon of its reſemblance to it; or it may be defined, a ſimile or compariſon intended to enforce and illuſtrate the thing we ſpeak of, without the ſigns or forms of compariſon. Thus, if we ſay, *God is* a ſhield *to good men*, it is a metaphor; becauſe the ſign of compariſon is not expreſſed, though the reſemblance which is the foundation of the trope, is plain; for as a ſhield guards him that bears it, againſt the attacks of an enemy, ſo the providence and favour of God protects good men from malice and misfortunes: but if the ſentence be put thus, *God is* as a ſhield *to good men*, then it becomes a ſimile or compariſon.

METAPHYSICS.

METAPHYSICS is that part of philoſophy which conſiders the nature and properties of thinking beings.

Ariſtotle, after treating on phyſics, begins his next book, (in which he pretends to elevate the mind above corporeal objects. to fix it on the contemplation of God, of angels, and of things ſpiritual, and to enable it to judge of the principles of ſciences by abſtraction,) with the Greek words μετα τα φυσικα, *poſt phyſicam*, i. e. *after metaphyſics*. His diſciples, and ſucceeding philoſophers, have formed, of theſe two, one word, METAPHYSICS, by which they mean that ſcience of which we have juſt now given the definition.

Metaphyſics is divided, according to the objects that it conſiders, into ſix principal parts, which are called, 1. Ontology: 2. Coſmology: 3. Antrophology: 4. Pſychology: 5. Pneumatology: and, 6. Theodicy, or metaphyſical theology.

1. The doctrine that is named *Ontology*, is that part of metaphyſics which inveſtigates, and explains, the nature and general eſſence of all beings, as well as the qualities and attributes that eſſentially appertain to them, and which we ought to aſſign them by abſtraction, as conſidering them *a priori*. Hence it appears, that this doctrine ſhould proceed in its operations from the moſt ſimple ideas; ſuch as do not admit of any other qualities of which they may be compounded. Theſe ſimple ideas are, for example, thoſe of being, of eſſence, of ſubſtance, of mode, of exiſtence as well with regard to time as place, of a neceſſary cauſe, of unity, the idea of negation, the difference between a being that is ſimple or compound, neceſſary or accidental, finite or infinite; the idea of eſſential and abſtract properties, as of the greatneſs, perfection, and goodneſs of beings; and ſo of the reſt. The buſineſs therefore of ontology, is to make us acquainted with every kind of being in its eſſence and abſtract qualities, and ſuch as are diſtinct from all other beings. This knowledge being once eſtabliſhed on ſimple principles, juſt conſequences may from thence be drawn, and thoſe things proved after which metaphyſics inquires, and which is its buſineſs to prove.

It is eaſy to conceive, that even a clear knowledge of beings, and their eſſential properties, would be ſtill defective and uſeleſs to man, if he did not know how to determine and fix his ideas by proper denominations, and conſequently to communicate his perceptions to thoſe whom he would inſtruct, or againſt whom he is obliged to diſpute, as they would not have the ſame perceptions that he has. It is, by the way, perhaps one of the greateſt advantages that we have over other animals, to be able ſo to determine our ideas by ſigns or denominations, either of writing or ſpeech, as to refer each particular perception to its general idea, and each general perception to its particular idea. To render therefore our ideas intelligible to others, we muſt have determinate words or denominations for each being, and the qualities of each being; and ontology teaches us thoſe terms which are ſo neceſſary to fix our ideas, and to give them the requiſite

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requiſite perſpicuity and preciſion, that we may not diſpute about words when we endeavour to extend the ſphere of our knowledge, or when we debate concerning the eſſence of an object, or endeavour to make it more evident. It is for this reaſon that ontology was formerly regarded as a barren ſcience, that conſiſted of technical terms only; as a mere terminology: whereas the beſt modern philoſophers make it a more ſubſtantial ſcience, by annexing determinate ideas to thoſe words, and the examination of thoſe objects themſelves that theſe terms imply. But the misfortune is, to ſpeak the truth, that in this ontologic determination there is ſtill much uncertainty and ſophiſtry. For, in the firſt place, we yet know of no metaphyſics where all the definitions are juſt; and in the ſecond place, the words that are employed in theſe definitions have always ſomething equivocal in their meaning, and have conſequently themſelves need of definitions; and in this manner we may recede to infinity, unleſs we recur to the firſt impreſſions that the ſimple words have made in our minds, and the primitive ideas which they there excite. The words *man*, *love*, *coach*, &c. ſay more, and make a ſtronger impreſſion, than all the definitions we can give of them; by ontologic explications they are almoſt always covered with a dark cloud.

2 Metaphyſics, after having, in as ſolid a manner as poſſible, explained and eſtabliſhed the principles above mentioned, continues its inquiries to the ſecond part, that is called *Coſmology*, and examines into the eſſence of the world, and all that it contains; its eternal laws; of the nature of matter; of motion; of the nature of tangible bodies, of their attributes and eſſential qualities, and of all that can be known by abſtraction, and ſometimes alſo by adding the lights that man acquires concerning them by the experience of his ſenſes. It is alſo in coſmology that we examine the Leibnitzian ſyſtem; that is, whether God, in creating the world, muſt neceſſarily have created the beſt world; and if this world be ſo in effect. And in this manner they purſue the argument from conſequence to conſequence to its laſt reſort. All philoſophers, however, do not go equally deep. Each mind has its doſe of penetration. Due care ſhould be likewiſe taken, that ſubtility, in this chain of reaſoning, carried beyond the general bounds of the human mind, do not prejudice either the perſpicuity or the truth of ideas: ſeeing that error here too nearly approaches the truth; and that every idea, which cannot be rendered intelligible, is in effect equal to a falſe idea.

3. *Anthrophology*, or the knowledge of man, forms the third branch of metaphyſics. It is ſubdivided into two parts. The firſt, which conſiſts in the knowledge of the exterior parts of the human frame, does not belong to this ſcience: anatomy and phyſiology teach that. The buſineſs here is only a metaphyſical examination of man, his exiſtence, his eſſence, his eſſential qualities and neceſſary attributes, all conſidered *a priori*: and this examen leads at the ſame time to

4. *Pſychology*, which is the fourth part of metaphyſics, and conſiſts in the knowledge of the ſoul in general, and of the ſoul of man in particular; concerning which, the moſt profound, the moſt ſubtle and abſtract reſearches have been made, that the human reaſon is capable of producing; and concerning the ſubſtance of which, in ſpite of all theſe efforts, it is yet extremely difficult to aſſert any thing that is rational, and ſtill leſs any thing that is poſitive and well ſupported.

5. The fifth part of metaphyſics is called *Pneumatology*. It is not a very long time ſince this term has been invented, and that metaphyſicians have made of it a diſtinct doctrine. By this they mean the knowledge of all ſpirits, angels, *&c.* It is eaſy to conceive that infinite art is neceſſary to give an account of what we do not abſolutely know any thing, and of which, by the nature of the ſubject itſelf, we never can know any thing. But the metaphyſician preſently offers to ſhow us, "what is the idea of a ſpirit; the effective exiſtence of a ſpirit; what are its general qualities and properties; that there are rational ſpirits, and that theſe rational ſpirits have qualities that are founded in the moral qualities of God:" for this is, in ſo many words, what is taught us by pneumatology or pneumatics.

6. *Metaphyſical Theology*, which M. Leibnitz and ſome others call *Theodicy*, is the ſixth and laſt doctrine of metaphyſics. It teaches us the knowledge of the exiſtence of God; to make the moſt rational ſuppoſitions concerning his divine eſſence, and to form a juſt idea of his qualities and perfections, and to demonſtrate them by abſtract reaſoning *a priori*. Theodicy differs from natural theology, in as much as this laſt borrows, in fact, from theodicy, proofs and demonſtrations to confirm the exiſtence of a Supreme Being; but after having ſolidly eſtabliſhed that great truth, by extending its conſequences, natural theology teaches us what are the relations and connexions that ſubſiſt between that Supreme Being and man, and what are the moral duties that reſult from that connexion. As pneumatology is a ſcience highly inſidious and chimerical, ſo is metaphyſical theology ſuſceptible of ſound argument and demonſtration; to the great comfort of mankind, the whole of whoſe happineſs is founded on the certainty of this ſcience. If the effects and operations of ſpirits in the univerſe were as evident as the effects and operations of the Deity, and their neceſſary exiſtence as capable of being proved *a priori*, pneumatology would be a doctrine of equal certainty with theodicy: but as neither one nor the other can be proved, with regard to ſpirits in general, whilſt God manifeſts himſelf in every part of nature, we have only to deſcend from the moſt ſimple and abſtract ideas, to thoſe that are the moſt compound; and from thence to reaſcend, by a chain of reaſonings, from the creature up to the Author of the creature and of all nature: We ſhall find, that the reſult of all theſe operations of the mind will conſtantly be, The neceſſity of the exiſtence of a God; and we may at all times determine, though very imperfectly, from the weakneſs of our diſcernment, what that Supreme Being muſt be, by poſitively determining what he cannot be. Every thing that can concur to furniſh new proofs on this ſubject, or to elucidate and eſtabliſh thoſe which are already known, is therefore of ineſtimable value to mankind; and though this were the only object of metaphyſics, it would highly merit the attention of thoſe of the moſt refined and moſt exalted genius.

AFTER giving this general view of the ſubject, we ſhall proceed

proceed to give the ſubſtance of what Mr Locke has delivered upon it.

Of ideas in general, and their original.

By the term *idea*, as defined by Mr Locke, is meant whatever is the object of the underſtanding when a man thinks, or whatever it is which the mind can be employed about in thinking.

In order to trace the manner by which we acquire theſe ideas, let us ſuppoſe the mind to be, as we ſay, *white paper*, void of all characters, without any *ideas*: how comes it to be furniſhed? whence has it all the materials of reaſon and knowledge? From *experience* and *obſervation*. This, when employed about external ſenſible objects, we may call *ſenſation*: by this we have the ideas of *bitter*, *ſweet*, *yellow*, *hard*, &c. which are commonly called *ſenſible qualities*, becauſe conveyed into the mind by the ſenſes. The ſame experience, when employed about the internal operations of the mind, perceived and reflected on by us, we may call *reflection*: hence we have the *ideas* of *perception*, *thinking*, *doubting*, *willing*, *reaſoning*, &c.

Theſe two, viz. *external material things* as the objects of ſenſation, and *the operations of our own minds* as the objects of reflection, are the only *originals* from whence all our *ideas* take their beginnings: the underſtanding ſeems not to have the leaſt glimmering of *ideas*, which it doth not receive from one of theſe two *ſources*. Theſe, when we have taken a full ſurvey of them, and their ſeveral *modes* and compoſitions, we ſhall find to contain our whole ſtock of *ideas*; and that we have nothing in our minds which did not come in one of theſe two ways.

It is evident, that children come by degrees to be furniſhed with *ideas* from the objects they are converſant with: they are ſo ſurrounded with bodies that perpetually and diverſely affect them, that ſome ideas will (whether they will or no) be imprinted on their minds. *Light* and *colours*, *ſounds* and *tangible* qualities, do continually ſolicite their proper ſenſes, and force an entrance into the mind. It is late, commonly, before *children* come to have *ideas* of the operations of their minds; and ſome men have not any very clear or perfect *ideas* of the greateſt part of them all their lives: becauſe, though they paſs there continually, yet, like floating viſions, they make not deep impreſſions enough to leave in the mind clear and laſting *ideas*, till the underſtanding turns inward upon itſelf, and reflects on its own operation, and makes them the objects of its own contemplation.

When a man *firſt perceives*, then he may be ſaid *to have ideas*; having *ideas*, and perception, ſignifying the ſame thing.

Of ſimple ideas.

Of ideas, ſome are *ſimple*, others *complex*. A *ſimple idea* is one uniform appearance or conception in the mind, which is not diſtinguiſhable into different *ideas*. Such are the *ideas* of *ſenſible qualities*, which though they are in the things themſelves ſo united and blended, that there is no ſeparation, no diſtance between them, yet the *ideas* they produce in the mind enter by the ſenſes ſimple and unmixed. Thus, though the hand feels *ſoftneſs* and *warmth* in the ſame piece of *wax*, yet the *ſimple ideas* thus united in the ſame ſubject are as perfectly *diſtinct* as thoſe that come in by different ſenſes.

Theſe *ſimple ideas* are ſuggeſted no other way than from the two ways above mentioned, *viz. ſenſation* and *reflection*.

The mind being once ſtored with the *ſimple ideas*, has the power to repeat, compare, and unite them to an infinite variety; and ſo can make, at pleaſure, new *complex ideas*. But the moſt enlarged underſtanding cannot frame one new *ſimple idea*; nor by any force deſtroy them that are there.

Of ideas of one ſenſe.

Ideas, with reference to the different ways wherein they approach the mind, are of *four ſorts*.

Firſt, There are ſome which come into our minds by *one ſenſe* only.

Secondly, There are others conveyed into the mind by *more ſenſes than one*.

Thirdly, Others that are had from *reflection* only.

Fourthly, There are ſome ſuggeſted to the mind by all the ways of *ſenſation* and *reflection*.

Firſt, ſome enter into the mind only by one ſenſe peculiarly adapted to receive them. Thus colours, ſounds, ſmells, &c. come in only by the eyes, ears, and noſe. And if theſe organs are any of them ſo diſordered as not to perform their functions, they have no other way to bring themſelves in view, and be perceived by the underſtanding.

We ſhall here mention one, which we receive by our touch, becauſe it is one of the chief ingredients in many of our complex ideas; and that is, the idea of *ſolidity*: it ariſes from the reſiſtance one body makes to the entrance of another body into the place it poſſeſſes, till it has left it. There is no idea which we more conſtantly receive from ſenſation than this. In whatever poſture we are, we feel ſomewhat that ſupports us, and hinders us from ſinking downwards: and the bodies we daily handle, make us perceive, that while they remain between them, they do, by an unſurmountable force, hinder the approach of the parts of our hands that preſs them. This ſeems to be the moſt eſſential property of body, and that whereby we conceive it to fill ſpace: the idea of which is, that where we imagine any ſpace taken up by a ſolid ſubſtance, we conceive it ſo to poſſeſs it, that it excludes all other ſolid ſubſtances. This reſiſtance is ſo great, that no force can ſurmount it. All the bodies in the world preſſing a *drop of water* on all ſides, will never be able to overcome the reſiſtance it makes to their approaching one another, till it be removed out of their way.

The idea of *ſolidity* is diſtinguiſhed from that of *pure ſpace*, in as much as this *latter* is neither capable of reſiſtance nor motion: it is diſtinguiſhed from *hardneſs*, in as much as hardneſs is a firm coheſion of the ſolid parts of matter making up maſſes of a ſenſible bulk, ſo that the whole doth not eaſily change its figure. Indeed, *hard* and *ſoft*, as commonly apprehended by us, are but *relative* to the conſtitutions of our bodies: that being called *hard* which will put us to pain ſooner than change its figure by the preſſure of any part of our bodies; and that *ſoft*, which

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which changes the ſituation of its parts upon an eaſy and unpainful touch.

This difficulty of changing ſituation among the parts, gives no more ſolidity to the hardeſt body, than to the ſofteſt; nor is an adamant one jot more ſolid than water. He that ſhall fill a yielding ſoft body well with air or water, will quickly find its reſiſtance. By this we may diſtinguiſh the idea of the extenſion of body, from the idea of the extenſion of ſpace: That of body, is the coheſion or continuity of ſolid, ſeparable, and moveable parts; that of ſpace, the continuity of unſolid, inſeparable, and immoveable parts. Upon the ſolidity of bodies depends their mutual impulſe, reſiſtance, and protruſion.

Of ſimple ideas of different ſenſes.

Some ideas we get into the mind by *more than one ſenſe*; as *ſpace*, *extenſion*, *figure*, *reſt*, and *motion*. Theſe are perceivable by the eyes and touch.

Of ſimple ideas of reflection.

Some ideas are had from reflection only: Such are the ideas we have of the operations of our minds; of which the two principal are, *perception*, or *thinking*; and *volition*, or *willing*. The powers of producing theſe operations are called *faculties*; which are, the *underſtanding*, and *will*. The ſeveral *modes* of thinking, *&c.* belong to this head.

Of ſimple ideas of ſenſation and reflection.

There are ſome ſimple ideas conveyed into the mind by all the ways of *ſenſation* and *reflection*; ſuch are *pleaſure*, *pain*, *power*, *exiſtence*, *unity*, *ſucceſſion*. Pleaſure or delight, pain or uneaſineſs, accompany almoſt every impreſſion on our ſenſes, and every action or thought of the *mind*.

The Author of our beings having given a power to our minds, in ſeveral inſtances, to chuſe amongſt its ideas which it will think on; to excite us to theſe actions of *thinking* and *motion*, he has joined to ſeveral thoughts and ſenſations a perception of delight; without this we ſhould have no reaſon to prefer one thought or action to another.

Pain has the ſame efficacy to ſet us on work that pleaſure has; ſince we are as ready to avoid that, as to purſue this. This is worth our conſideration, that *pain is often produced by the ſame objects and ideas that produce pleaſure* in us. This their near conjunction gives us new occaſion of admiring the wiſdom and goodneſs of our *Maker*; who, deſigning the preſervation of our being, has annexed pain to the application of many things to our bodies, to warn us of the harm they will do us, and as advices to withdraw us from them. But he not deſigning our preſervation barely, but the preſervation of every part and organ in its perfection, hath in many caſes annexed pain to thoſe very ideas which delight us. Thus heat, that is very agreeable to us in one degree, by a little greater increaſe of it proves no ordinary torment: Which is wiſely ordered by *nature*, that when any object does by the vehemence of its operation diſorder the inſtruments of ſenſation, whoſe ſtructures cannot but be very delicate, we might by the pain be warned to withdraw before the organ be quite put out of order. That this is the *end of pain*, appears from this conſideration; that though great light is inſufferable to the eyes, yet the higheſt degree of *darkneſs* does not at all diſeaſe them; becauſe *that* cauſes no diſorderly motion in that curious organ the eye. But exceſs of *cold*, as well as *heat*, pains us; becauſe it is equally deſtructive to the temper which is neceſſary to the preſervation of life.

Exiſtence and *unity* are two other ideas ſuggeſted by every object without, and every idea within. When ideas are in our minds, we conſider them as being actually there, as well as we conſider things to be actually without us; which is, that they *exiſt*, or have exiſtence: And whatever we conſider as *one thing*, whether a *real being*, or *idea*, ſuggeſts the idea of *unity*.

Power is another idea derived from theſe ſources: For finding in ourſelves that we can *think*, and *move* ſeveral parts of our bodies at pleaſure, and obſerving the *effects* that natural bodies produce in one another; by both theſe ways we get the idea of *power*.

Succeſſion is another idea ſuggeſted by our ſenſes, and by reflection on what paſſes in our minds: For if we look into ourſelves, we ſhall find our *ideas* always, whilſt we are awake, or have any thought, paſſing in train, one going and another coming, without intermiſſion.

Some farther conſiderations concerning ſimple ideas.

Whatsoever is able, by affecting our ſenſes, to cauſe any perception in the mind, doth thereby produce in the underſtanding a *ſimple idea*; which, whatſoever be the cauſe of it, is looked upon as a *real poſitive idea* in the underſtanding. Thus the ideas of *heat* and *cold*, *light* and *darkneſs*, *motion* and *reſt*, &c. are equally poſitive in the mind, though ſome of their cauſes may be mere *privations*.

That a *privative* cauſe may produce a *poſitive* idea, appears from ſhadows; which (though nothing but the abſence of light) are diſcernible, and cauſe clear and poſitive ideas. We have indeed ſome *negative* names which ſtand not directly for poſitive ideas, but for their abſence; ſuch as *inſipid*, *ſilence*, which denote poſitive ideas, *viz.* *taſte* and *ſound*, with a ſignification of their abſence.

It will be uſeful to diſtinguiſh *ideas* as they are *perceptions* in our minds, from what *they are in the bodies* that cauſe ſuch perceptions in us; for we are not to think the former exact images and reſemblances of ſomething inherent in the ſubject, moſt of thoſe of *ſenſation* being, in the mind, no more the likeneſs of ſomething exiſting without us, than the names that ſtand for them are the likeneſs of our ideas, which yet, upon hearing, they excite in us.

Whatſoever the *mind perceives in itſelf*, or is the immediate object of perception, thought, or underſtanding, is an idea: And the power to produce any idea in our mind, is the *quality of the ſubject* wherein that power exiſts. Thus a *ſnow-ball* having the power to produce in us the ideas of *white*, *cold*, and *round*; thoſe *powers*, as they are in the ſnow-ball, are called *qualities*; and as they are *ſenſations* or *perceptions* in our underſtandings, they are called *ideas*. Theſe *qualities* are of *two ſorts*: Firſt, *original*, or primary; ſuch are *ſolidity*, *extenſion*,

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tenſion, *motion*, or *reſt*, *number*, and *figure*. Theſe are inſeparable from body, and ſuch as it conſtantly keeps in all its changes and alterations.

Secondly. *Secondary qualities*; ſuch as *colours*, *ſmells*, *taſtes*, *ſounds*, &c. which, whatever reality we by miſtake may attribute to them, are in truth nothing in the objects themſelves, but *powers* to produce various ſenſations in us; and depend on the qualities before mentioned.

The *ideas* of *primary* qualities of bodies, are reſemblances of them; and their patterns really exiſt in bodies themſelves: But the ideas produced in us by ſecondary qualities have no reſemblance of them at all; and what is *ſweet*, *blue*, or *warm*, in the idea, is but the certain bulk, figure, and motion of the inſenſible parts in the bodies themſelves, which we call ſo

Thus we ſee, that fire at one diſtance produces in us the ſenſation of *warmth*, which at a nearer approach cauſes the ſenſation of *pain*. Now what reaſon have we to ſay, that the idea of *warmth* is actually in the fire; but that of *pain* not in the fire; which the ſame fire produces in us the ſame way? The bulk, number, figure, and motion of the parts of fire, are really in it, whether we perceive them or no; and therefore may be called *real* qualities, becauſe they really exiſt in that body: But *light* and *heat* are no more really in it, than ſickneſs or pain: Take away the ſenſation of them; let not the eyes ſee light or colours, nor the ear hear ſounds; let the palate not taſte, or the noſe ſmell; and all *colours*, *taſtes*, *odours*, and *ſounds*, as they are ſuch particular ideas, vaniſh and ceaſe, and are reduced to their cauſes, (that is,) bulk, motion, figure, *&c.* of parts.

Theſe *ſecondary* qualities are of two ſorts. Firſt, *Immediately perceivable*; which by immediately operating on our bodies, produce ſeveral different ideas in us. Secondly, *Mediately perceivable*; which by operating on other bodies, change their primary qualities, ſo as to render them capable of producing ideas in us different from what they did before. Theſe laſt are powers in bodies, which proceed from the particular conſtitution of thoſe primary and original qualities, to make ſuch a change in the *bulk*, *figure*, *texture*, &c. of another body, as to make it operate on our ſenſes different from what it did before; as in fire, to make lead fluid. Theſe two laſt being nothing but powers relating to other bodies, and reſulting from the different modifications of the original qualities, are yet otherwiſe thought of; the former being eſteemed *real qualities*, but the latter barely *powers*.

Of perception.

PERCEPTION is the firſt idea we receive from reflection: It is by ſome called *thinking* in general: Though *thinking*, in the propriety of the *Engliſh* tongue, ſignifies that ſort of operation of the mind about its ideas, wherein the mind is active; where it conſiders any thing with ſome degree of voluntary attention: For in bare *perception* the mind is, for the moſt part, only *paſſive*; and what it perceives, it cannot avoid perceiving. What this is, we cannot otherwiſe know, than by reflecting on what paſſes in our minds when we ſee, feel, hear, *&c.*

Impreſſions made on the outward parts, if they are not taken notice of within, cauſe no *perception*; as we ſee in thoſe whoſe minds are intently buſied in the contemplation of certain objects.

We may obſerve that the ideas we receive from ſenſation, are often in grown people altered by the judgment, without our taking notice of it. Thus a globe of any uniform colour, (as of gold, or jet,) being ſet before our eyes, the *idea* thereby imprinted is of a flat circle variouſly ſhadowed: But being accuſtomed to perceive what kind of appearance convex bodies are wont to make in us the judgment alters the appearances into their cauſes; and, from that variety of ſhadow or colour, frames to itſelf the perception of a convex figure of one uniform colour. This in many caſes, by a ſettled habit, is performed ſo readily, that we take that for the perception of our ſenſation, which is but an idea formed by the judgment; ſo that one ſerves only to excite the other, and is ſcarce taken notice of itſelf: As a man who reads or hears with attention, takes little notice of the characters or ſounds, but of the ideas that are excited in him by them.

Perception is alſo the firſt ſtep and degree towards knowledge, and the inlet of all the materials of it; ſo that the fewer ſenſes any man has, and the duller the impreſſions that are made by them are, the more remote he is from that knowledge which is to be found in other men.

Of retention.

THE next faculty of the mind whereby it makes a further progreſs towards knowledge, is called *retention*; which is the keeping of thoſe ideas it has received. Which is done two ways:

Firſt, By keeping the idea which is brought into the mind for ſome time actually in view; which is called *contemplation*.

Secondly, By reviving thoſe ideas in our minds which have diſapeared, and have been, as it were, laid out of ſight: And this is *memory*; which is, as it were, the ſtore-houſe of our ideas; for the narrow mind of man not being capable of having many ideas under view at once, it was neceſſary to have a repoſitory to lay up thoſe ideas, which at another time it may have uſe of. But our ideas being nothing but actual perceptions in the mind, which ceaſe to be any thing when there is no perception of them, this lying up of our *ideas* in the repoſitory of the memory ſignifies no more but this, that the mind has a power, in many caſes, to revive perceptions it has once had, with this additional perception annexed to them, that it has had them them before And it is by the aſſiſtance of this faculty, that we are ſaid to have all thoſe ideas in our underſtandings which we can bring in ſight, and make the objects of our thoughts, without the help of thoſe ſenſible qualities which firſt imprinted them there.

Thoſe ideas that are often refreſhed by a frequent return of the objects or actions that produce them, fix themſelves beſt in the memory, and remain longeſt there: Such are the *original qualities of bodies*, viz. Solidity, extenſion, figure, motion, *&c.* Theſe and the like are ſeldom quite loſt while the mind retains any *ideas* at all.

Of

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Of diſcerning, and other operations of the mind.

ANOTHER faculty of the mind, is that of *diſcerning between its ideas*. On this depends the evidence and certainty of ſeveral general propoſitions. In being able nicely to diſtinguiſh one thing from another, where there is the leaſt difference, conſiſts, in a great meaſure, that *exactneſs of judgment* and *clearneſs of reaſon* which is to be obſerved in one man above another.

To the well diſtinguiſhing our *ideas*, it chiefly contributes that they be clear and determinate; and when they are ſo, it will not breed any confuſion or miſtake about them, though the ſenſes ſhould convey them from the ſame object differently on different occaſions.

The comparing of our *ideas* one with another in reſpect of *extent*, *degree*, *time*, *place*, or any other circumſtances, is another operation of the mind about its *ideas* which is the ground of *relations*. Brutes ſeem not to have this faculty in any great degree. They have probably ſeveral *ideas* diſtinct enough; but cannot compare them farther than ſome ſenſible circumſtances annexed to the objects themſelves.

Compoſition is another operation of the mind, whereby it combines ſeveral of its ſimple *ideas* into *complex* ones: Under which operation we may reckon that of *enlarging*; wherein we put ſeveral *ideas* together of the ſame kind, as ſeveral units to make a *dozen*.

Abſtraction is another operation of the mind, whereby the mind forms general *ideas* from ſuch as it received from particular objects; which it does by conſidering them, as they are in the mind ſuch appearances ſeparate from the circumſtances of real exiſtence, as *time*, *place*, &c. Theſe become general *repreſentatives* of all of the ſame kind, and their names applicable to whatever exiſts comformable to ſuch abſtract *ideas*. Thus the colour received from *chalk*, *ſnow*, and *milk*, is made a repreſentative of all of that kind; and has a name given it (*whiteneſs*,) which ſignifies the ſame quality, wherever to be found or imagined. And thus *univerſals*, both *ideas* and *terms*, are made.

Of complex ideas.

IN the reception of ſimple ideas the mind is only *paſſive* having no power to frame any one to itſelf nor having any idea which does not wholly conſiſt of them. But about theſe ſimple ideas its exerts ſeveral acts of its own, whereby out of them, as the materials and foundations of the reſt, the other are framed: The acts of the mind, wherein it exerts its power over its ſimple ideas, are chiefly theſe three: *Firſt*, It combines ſeveral ſimple ideas into one compound one; and thus all *complex ideas* are made. *Secondly*, It brings two ideas, whether *ſimple* or *complex*, together, and ſets them by one another, ſo as to take a view of them at once, without uniting them into one; by which way it gets all its ideas of relations. *Thirdly*, It ſeparates them from all other ideas that accompany them in their real exiſtence: And thus all its *general ideas* are made. As *ſimple ideas* are obſerved to exiſt in ſeveral combinations united together, ſo the mind may conſider them as united, not only as they are really united in external objects, but as itſelf has joined them *Ideas* thus made up of ſeveral ones put together, are called *complex*; as *man*, *army*, *beauty*, *gratitude*, &c. By this faculty of repeating and joining together its *ideas*, the mind has great power in varying and multiplying the objects of its thoughts. But it is ſtill confined to thoſe ſimple *ideas* which it received from the two ſources of *ſenſation* and *reflection*. It can have no other *ideas* of ſenſible qualities, than what come from without by the ſenſes, nor any other *ideas* of the operations of a thinking ſubſtance than what it finds in itſelf; but having once got theſe ſimple *ideas*, it can by its own power put them together, and make new *complex ones*, which it never received ſo united.

Complex ideas, however compounded and decompounded, though their number be infinite, and their variety endleſs, may all be reduced under theſe three heads: 1ſt, *Modes*; 2dly, *Subſtances*; 3dly, *Relations*.

1ſt, *Modes* are ſuch complex *ideas* as contain not the ſuppoſition of ſubſiſting by themſelves, but are conſidered as dependances on, and affections of ſubſtances; as *triangle*, *gratitude*, *murder*, &c. Theſe modes are of two ſorts: Firſt, *Simple*; which are combinations of the ſame ſimple *idea*; as a *dozen*, *ſcore*, &c. which are but the *ideas* of ſo many diſtinct units put together. Secondly, *Mixed*; which are compounded of ſimple *ideas* of ſeveral kinds; as *beauty*, which conſiſts in a certain compoſition of colour and figure, cauſing delight in the beholder; *theft*, which is the concealed change of the poſſeſſion of any thing, without the conſent of the proprietor. *Theſe* viſibly contain a combination of *ideas* of ſeveral kinds.

2dly, *Subſtances*. The *ideas* of ſubſtances are only ſuch combinations of ſimple *ideas*, as are taken to repreſent diſtinct particular things ſubſiſting by themſelves, in which the confuſed *idea* of ſubſtance is always the chief. Thus a combination of the *ideas* of a certain figure, with the powers of motion, thought, and reaſoning, joined to ſubſtance, make the ordinary *idea* of man.

Theſe again are either of *ſingle ſubſtances*, as *man*, *ſtone*; or of *collective*, or ſeveral put together, as *army*, *heap*. *Ideas* of ſeveral ſubſtances thus put together, are as much each of them one ſingle *idea*, as that of a *man* or an *unit*.

3dly, *Relations*; which conſiſt in the conſideration and comparing of one *idea* with another. Of theſe ſeveral kinds we ſhall treat in their order.

Of ſimple modes: And, firſt, of the ſimple modes of ſpace.

CONCERNING *ſimple modes* we may obſerve, that the modifications of any *ſimple ideas* are as perfectly different and diſtinct ideas in the mind, as thoſe of the greateſt diſtance or contrariety: Thus *two* is as diſtinct from *three*, as *blueneſs* from *heat*.

Space is a ſimple idea which we get both by our ſight and touch When we conſider it barely in length between two bodies, it is called *diſtance*: when in length, breadth, and thickneſs, it may be called *capacity*. When conſidered between the extremities of matter, which fills the capacity of ſpace with ſomething ſolid, tangible, and moveable, it is called *extenſion*. And thus *extenſion* will be an *idea* belonging to body; but *ſpace* may be conceived without it.

Each

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Each different *diſtance* is a different modification of ſpace; and each *idea* of any different ſpace is a *ſimple mode* of this *idea*. Such are an *inch*, *foot*, *yard*, &c. When theſe *ideas* are made familiar to mens thoughts, they can in their minds repeat them as often as they will, without joining to them the *idea* of body, and frame to themſelves the *ideas* of feet, yards, or fathoms, beyond the utmoſt bounds of all bodies; and, by adding theſe ſtill one to another, enlarge their *idea* of ſpace as much as they pleaſe. From this power of repeating any *idea* of diſtance, without being ever able to come to an end, we come by the *idea* of immenſity.

Another modification of *ſpace* is taken from the *relation* of the parts of the termination of extenſion or circumſcribed ſpace amongſt themſelves; and this is what we call *figure*. This the *touch* diſcovers in ſenſible bodies, whoſe extremities come within our reach; and the *eye* takes both from bodies and colours, whoſe boundaries are within its view; where obſerving how the extremities terminate either in ſtraight lines, which meet at diſcernible angles, or in crooked lines, wherein no angles can be perceived; by conſidering theſe as they relate to one another in all parts of the extremities of any body or ſpace, it has that idea we call *figure*: which affords to the mind infinite variety.

Another *mode* belong to this head, is that of *place*. Our idea of *place* is nothing but the relative poſition of any thing with reference to its diſtance from ſome fixed and certain points. Whence we ſay, that a thing has or has not changed *place*, when its diſtance either is or is not altered with reſpect to thoſe bodies which which we have occaſion to compare it. That this is ſo, we may eaſily gather from hence, that we can have no idea of the place of the *univerſe*, though we can of all its parts. To ſay that the world is *ſomewhere*, means no more than that it does *exiſt*. The word *place* is ſometimes take to ſignify that *ſpace* which any body takes up; and ſo the univerſe may be conceived in a place.

Of duration, and its ſimple modes.

THERE is another ſort of *diſtance*, the *idea* of which we get from the fleeting and perpetually periſhing parts of ſucceſſion, which we call *duration*. The ſimple modes of it are any different lengths of it whereof we have diſtinct *ideas*; as *hours*, *days*, *years*, &c. *time*, and *eternity*.

The *idea* of *ſucceſſion* is got by reflecting on that train of *ideas* which conſtantly follow one another in our minds as long as we are awake. The diſtance between any parts of this *ſucceſſion*, is what we call *duration*; and the continuation of the exiſtence of ourſelves, or any thing elſe, *commenſurate* to the ſucceſſion of any *ideas* in our minds, is what we call our *own duration*, or *that* of another thing co-exiſting with our thinking. That this is ſo, appears from hence, that we have no perception of ſucceſſion or duration, when that ſucceſſion of our *ideas* ceaſes, as in *ſleep*: the moment that we ſleep, and awake, how diſtant ſoever, ſeems to be joined and connected. And poſſibly it would be ſo to a waking man, could he fix upon one *idea* without variation and the ſucceſſion of others. And we ſee that they whoſe thoughts are very intent upon one thing, let ſlip out of their account a good part of that *duration*, and think that time ſhorter than it is. But if a man, during his ſleep, *dream*, and a variety of *ideas* make themſelves perceptible in his mind one after another, he hath then, during ſuch dreaming, a ſenſe of *duration*, and of the length of it.

A man having once got this *idea* of duration, can apply it to things which exiſt while he does not think: and thus we meaſure the time of our ſleep, as well as that wherein we are awake.

Duration, as marked by certain periods and meaſures, is what we moſt properly call *time*; which we meaſure by the diurnal and annual *revolutions* of the ſun, as being conſtant, regular, and univerſally obſervable by all mankind, and ſuppoſed equal to one another.

The mind having once got ſuch a meaſure of *time*, as the annual revolution of the ſun, can eaſily apply it to duration, wherein that meaſure itſelf did not exiſt; and the *idea* of *duration* equal to *an annual revolution of the ſun*, is as eaſily applicable in our thoughts to duration where no ſun nor motion was, as the *idea* of a *foot* or *yard* to diſtances beyond the confines of the world.

By the ſame means, and from the ſame original that we come to have the *idea* of time, we have alſo that *idea* which we call *eternity*: for having got the ideas of certain lengths of duration, we can in our thoughts add them to one another as oft as we pleaſe, without ever coming to an end.

And thus it is plain, that from the two fountains of all knowledge before mentioned, *viz. ſenſation* and *reflection*, we get the ideas of duration, and the ſeveral meaſures of it.

Of numbers.

THE complex *ideas* of *number* are formed by adding ſeveral *units* together. The *ſimple modes* of it are each ſeveral combinations, as *two*, *three*, &c. Theſe are of all others moſt diſtinct, the neareſt being as clearly different from each other as the moſt remote: *two* being as diſtinct from *one*, as two hundred. But it is hard to form diſtinct *ideas* of every the leaſt exceſs in extenſion. Hence demonſtrations in numbers are more general in their uſe, and more determinate in their application, than thoſe of extenſion.

Simple modes of numbers being in our minds but ſo many combinations of units, which have no variety but *more* or *leſs*; *names* for each diſtinct combination ſeem more neceſſary than in any other ſort of *ideas*: For without a *name*, or *mark*, to diſtinguiſh that preciſe collection, it will hardly be kept from being a heap of confuſion. Hence ſome *Americans* have no diſtinct *idea* of any number beyond twenty; ſo that when they are diſcourſed with of greater numbers, they ſhew the hairs of their head. So that to reckon right, two things are required:

Firſt, That the mind diſtinguiſh carefully two *ideas* which are different one from another only by the addition or ſubſtraction of one unit.

Secondly, That it retain in memory the names or marks of the ſeveral combinations, from an unit to that number; and that in exact order, as they follow one another. In either

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either of which if it fails, the whole buſineſs of *numbering* will be diſturbed; and there will remain only the confuſed *idea* of *multitude*; but the *ideas* neceſſary to diſtinct numeration will not be attained to.

Of infinity.

THE *idea* ſignified by the name *infinity*, is beſt examined, by conſidering to *what* infinity is by the mind attributed, and then *how* it frames it. *Finite* and *infinite*, then, are looked upon as the modes of quantity; and attributed primarily to things that have parts, and are capable of increaſe or diminution by the *addition* or *ſubſtraction* of any the leaſt part. Such are the *ideas* of *ſpace*, *duration*, and *number*.

When we apply this *idea* to the *Supreme Being*, we do it primarily, in reſpect of his duration and ubiquity; more figuratively, when to his *wiſdom*, *power*, *goodneſs*, and other attributes, which are properly *inexhauſtable* and *incomprehenſible*: For when we call them infinite, we have no other *idea* of this infinity, but what carries with it ſome reflection on the *number* or the *extent* of the *acts* or *objects* of God's power and wiſdom, which can never be ſuppoſed ſo great, or ſo many, that theſe attributes will not always ſurmount and exceed, though we multiply them in our thoughts with the infinity of *endleſs number*.

The next thing to be conſidered, is, *How we come* by the *idea* of infinity. Every one that has any *idea* of any ſtated lengths of ſpace, as a *foot*, *yard*, &c. finds that he can repeat that *idea*, and join it to *another*, to a *third*, and ſo on without ever coming to an end of his additions. From this power of enlarging his *idea* of ſpace, he takes the *idea* of infinite ſpace, or *immenſity*. By the ſame power of repeating the *idea* of any length of duration we have in our minds, with all the endleſs addition of number, we come by the *idea* of *eternity*.

If our *idea* of *infinity* be got by repeating without end our own *ideas*; why do we not attribute it to other *ideas*, as well as thoſe of *ſpace* and *duration*; ſince they may be as eaſily and as often repeated in our minds, as the other: Yet no body ever thinks of infinite *ſweetneſs* or *whiteneſs*, though he can repeat the *idea* of ſweet or white as frequently as thoſe of *yard* or *day*. But thoſe *ideas* that have parts, and are capable of increaſe by the addition of any parts, afford us, by their repetition, an *idea* of infinity; becauſe with the endleſs repetition there is continued an enlargement, of which there is no end. But it is not ſo in other *ideas*: For if to the perfect *idea* I have of *white*, I add another of equal whiteneſs; it enlarges not my *idea* at all. Thoſe *ideas* that conſiſt not of parts, cannot be augmented to what proportion men pleaſe, or be ſtretched beyond what they have received by their ſenſes: But *ſpace*, *duration*, and *number*, being capable of increaſe by repetition, leave in the mind an *idea* of an endleſs room for more; and ſo thoſe *ideas* alone lead the mind towards the thought of infinity.

Of the modes of thinking.

WHEN the the mind turns its view inwards upon itſelf, *thinking* is the firſt *idea* that occurs: Wherein it obſerves a great variety of modifications; and thereof frames to itſelf diſtinct *ideas*. Thus the perception annexed to any impreſſion on the body made by an external object, is called *ſenſation*. When an *idea* recurs without the preſence of the object, it is called *remembrance*: When ſought after by the mind, and brought again in view, it is *recollection*: When held there long under attentive conſideration, it is *contemplation*. When *ideas* float in the mind without regard or reflection, it is called in French *revérie*; our language has ſcarce a name for it: When the *ideas* are taken notice of, and, as it were, regiſtered in the memory, it is *attention*: When the mind fixes its view on any one *idea*, and conſiders it on all ſides, it is *intention* and *ſtudy*. *Sleep*, without dreaming, is reſt from all theſe. And *dreaming* is the perception of *ideas* in the mind, not ſuggeſted by any external objects, or known occaſions; nor under any choice or conduct of the underſtanding.

Of the modes of pleaſure and pain.

PLEASURE and *pain* are ſimple *ideas*, which we receive both from ſenſation and reflection. There are thoughts of the mind, as well as ſenſations, accompanied with pleaſure or pain. Their cauſes are termed *good* or *evil*. *Pleaſure* and *pain*, and their cauſes *good* and *evil*, are the hinges upon which our paſſions turn; by reflecting on the various modifications or tempers of mind, and the internal ſenſations which pleaſure and pain, good and evil, produce in us, we may thence form to ourſelves the *ideas* of our paſſions. Thus by reflecting upon the thought we have of the delight which any thing is apt to produce in us, we have an *idea* we call *love*: And on the contrary, the thought of the pain which any thing preſent or abſent produces in us, is what we call *hatred*. *Deſire* is that uneaſineſs which a man finds in himſelf upon the abſence of any thing the preſent enjoyment of which carries the *idea* of delight with it. *Joy* is a delight of the mind ariſing from the preſent or aſſured approaching poſſeſſion of a good. *Sorrow* is an uneaſineſs of the mind, upon the thought of a good loſt, or the ſenſe of a preſent evil. *Hope* is a pleaſure in the mind, upon the thought of a probable future enjoyment of a thing which is apt to delight. *Fear* is an uneaſineſs of the mind, upon the thought of a future evil likely to befall us. *Anger* is a diſcompoſure of mind, upon the receipt of injury, with a preſent purpoſe of revenge. *Deſpair* is the thought of the unattainableneſs of any good. *Envy* is an uneaſineſs of mind, cauſed by the conſideration of a good we deſire, obtained by one we think ſhould not have had it before us.

It is to be conſidered, that in reference to the paſſions, the removal or leſſening of a pain, is conſidered and operates as a pleaſure; and the loſs or diminiſhing of a pleaſure, as a pain. And farther, that the paſſions in moſt perſons operate on the body, and cauſe various changes in it; but theſe being not always ſenſible, do not make a neceſſary part of the *idea* of each paſſion.

Of power.

THE mind being every day informed by the ſenſes of the alteration of thoſe ſimple *ideas* it obſerves in things without, reflecting alſo on what paſſes within itſelf, and obſerving

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obſerving a conſtant change of its *ideas*, ſometimes by the impreſſions of outward objects upon the ſenſes, and ſometimes by the determination of its own choice; and concluding, from what it has ſo conſtantly obſerved to have been, that the like changes will for the future be made in the ſame things, by the ſame agents, and by the like ways, conſiders in one thing the poſſibility of having any of its ſimple *ideas* changed, and in another the poſſibility of making that change, and ſo comes by that *idea* which which we call *power*. Thus we ſay *fire* has a power to *melt gold*, and make it fluid; and *gold* has a power to be *melted*.

Power thus conſidered, is twofold, *viz.* as able to make, or able to receive any change: the one may be called *active*, the other *paſſive power*. Of *paſſive power* all ſenſible things aboundantly furniſh us with *ideas*, whoſe ſenſible qualities and beings we find to be in a continual flux. Nor have we of *active power* fewer inſtances; ſince whatever change is obſerved, the mind muſt collect a power ſomewhere able to make that change. But yet, if we will conſider it attentively, bodies by our ſenſes do not afford us ſo clear and diſtinct an *idea* of *active* power as we have from reflection on the operations of our minds. For all power relating to action, and there being but two ſorts of *action*, viz. *thinking* and *motion*, let us conſider whence we have the cleareſt *ideas* of the powers which produce theſe actions.

Of *thinking*, body affords us no *idea* at all: It is only from reflection that we have that; neither have we from body any *idea* of the beginning of motion. A body at reſt, affords us no *idea* of any *active* power to move; and when it is ſet in motion itſelf, that motion is rather a paſſion than an action in it. The *idea* of the beginning of motion, we have only by reflection on what paſſes in ourſelves; where we find by experience, that barely by willing it, we can move the parts of our bodies which were before at reſt.

We find in ourſelves a power to begin or forbear, continue or end, ſeveral actions of our minds, and motions of our bodies, barely by a thought, or preference of the mind. This power which the mind has thus to order the conſideration of any *idea*, or the forbearing to conſider it; or to prefer the motion of any part of the body to its reſt, and *vice verſa*, in any particular inſtance, is that we call the *will*; the actual exerciſe of that power is that which we call *volition*, or *willing*. The forbearance or performance of that action, conſequent to ſuch order or command of the mind, is called *voluntary*; and whatſoever action is performed without ſuch a thought of the mind, is called *involuntary*.

The power of perception is that we call the *underſtanding*. *Perception*, which we make the act of the underſtanding, is of three ſorts: 1*ſt*, The perception of *ideas* in our minds. 2*dly*, The perception of the ſignification of ſigns. 3*dly*, The perception of the agreement or diſagreement of any diſtinct *ideas*. Theſe powers of the mind, *viz.* of perceiving and preferring, are uſually called by another name; and the ordinary way of ſpeaking is, that the underſtanding and will are two *faculties* of the mind.

From the conſideration of the extent of the power of the mind over the actions of the man, which every one finds in himſelf, ariſe the *ideas* of *liberty* and *neceſſity*: ſo far as a man has a power to think or not to think, to move or not to move, according to the preference or direction of his own mind, ſo far is a man free. Whereever any performance or forbearance are not equally in a man's power; where-ever doing, or not doing, will not equally follow upon the preference of his mind; there he is not *free*, though perhaps the action may be *voluntary*. So that the *idea* of *liberty*, is the *idea* of a power in any agent to do or forbear any action, according to the determination or thought of the mind whereby either of them is preferred to the other. Where either of them is not in the power of the agent to be produced by him, according to his volition, there he is not at liberty; that agent is under *neceſſity*. So that *liberty* cannot be where there is no *thought*, no *volition*, no *will*; but there may be thought, there may be will, there may be volition, where there is no *liberty*. Thus a *tennis ball*, whether in motion by the ſtroke of a racket, or lying ſtill at reſt, is not by any one taken to be a free agent. So a man ſtriking himſelf or his friend by a convulſive motion of his arm, which it is not in his power by volition or the direction of his mind to ſtop or forbear; no body thinks he has in this *liberty*; every one pities him, as acting by *neceſſity* and *conſtraint*. Again, ſuppoſe a man be carried whilſt faſt aſleep into a room, where is a perſon he longs to ſee, and be there locked faſt in, beyond his power to get out; he awakes, and is glad to ſee himſelf in ſo deſirable company; which he ſtays willingly in, that is, prefers his ſtaying to going away. Is not this ſtay voluntary? no body will doubt it; and yet being locked faſt in, he is not at liberty to ſtay, he has not freedom to be gone. So that *liberty* is not an *idea* belonging to volition or preferring, but to the perſon having the power of doing, or forbearing to do, according as the mind ſhall chuſe or direct.

As it is in the motions of the body, ſo it is in the thoughts of our minds: where any one is ſuch, that we have power to take it up, or lay it by, according to the preference of the mind, there we are at liberty. A waking man is not at liberty to think, or not to think, no more than he is at liberty whether his body ſhall touch any other or no: But whether he will remove his contemplation from one *idea* to another, is many times in his choice. And then he is, in reſpect of his *ideas*, as much at liberty, as he is in reſpect of bodies he reſts on. He can at pleaſure remove himſelf from one to another: but yet ſome *ideas* to the mind, like ſome motions to the body, are ſuch, as in certain circumſtances it cannot avoid, nor obtain their abſence by the utmoſt effort it can uſe. Thus a man on the rack is not at liberty to lay by the *idea* of *pain*, and entertain other contemplations.

Where-ever thought is wholly wanting, or the power to act or forbear according to the direction of thought, there neceſſity takes place. This in an agent capable of volition, when the beginning or continuation of any action is contrary to the preference of his mind, is called *compulſion*; when the hindering or ſtopping any action is contrary to his volition, it is called reſtraint: Agents that have no thought, no volition at all, are in every thing neceſſary agents.

Of

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Of mixed modes.

MIXED *modes* are combinations of *ſimple ideas* of different kinds. The mind being once furniſhed with ſimple *ideas*, can put them together in ſeveral compoſitions, without examining whether they exiſt ſo together in nature. And hence it is, that theſe ideas are called *notions*, as if they had their original and conſtant exiſtence more in the thoughts of men, than in the reality of things: and to form ſuch ideas, it ſufficed that the mind put the parts of them together, and that they were conſiſtent in the underſtanding, without conſidering whether they had any real being. There are three ways whereby we get theſe complex ideas of *mixed modes*.

1*ſt*, By *experience*, and obſervation of things themſelves: Thus by ſeeing two men wreſtle, we get the *idea* of wreſtling.

2*dly*, By *invention*, or voluntary putting together of ſeveral ſimple *ideas* in our own minds: So he that firſt invented *printing*, had an *idea* of it firſt in his mind before it ever exiſted.

3*dly*, By *explaining* the names of actions we never ſaw, or nations we cannot ſee; and by enumerating all thoſe *ideas* which go to the making them up. Thus the mixed mode, which the word *lie* ſtands for, is made up of theſe ſimple *ideas*: 1ſt, *Articulate ſounds*. 2dly, *Certain* ideas *in the mind of the ſpeaker*. 3dly, *Thoſe words, the ſigns of theſe* ideas. 4thly, *Thoſe ſigns put together*, by affirmation or negation, otherwiſe than the *ideas* they ſtand for are in the mind of the ſpeaker. Since languages are made, *complex ideas* are uſually got by the explication of thoſe terms that ſtand for them: for ſince they conſiſt of ſimple *ideas* combined, they may, by words ſtanding for thoſe ſimple *ideas*, be repreſented to the mind of one who underſtands thoſe words, though that combination of ſimple *ideas* was never offered to his mind by the real exiſtence of things.

Mixed modes have their *unity* from an act of the mind, combining thoſe ſeveral ſimple *ideas* together, and conſidering them as one complex one: the mark of this union is one *name* given to that combination. Men ſeldom reckon any number of *ideas* to make one complex one: but ſuch collections as there be names for. Thus the *killing of an old man*, is as fit to be united into one *complex idea*, as that of *a father*; yet there being no name for it, it is not taken for a particular complex *idea*, nor a diſtinct ſpecies of action from that of killing any other man.

Thoſe collections of *ideas* have names generally affixed, which are of frequent uſe in converſation: in which caſes men endeavour to communicate their thoughts to one another with all poſſible diſpatch. Thoſe others, which they have ſeldom occaſion to mention, they tie not together, nor give them names.

This gives the reaſon, why there are words in every language, which cannot be rendered by any one ſingle word of another. For the faſhions and cuſtoms of one nation make ſeveral combinations of *ideas* familiar in one, which another had never any occaſion to make. Such were Ὀστρακισμὸς among the Greeks, *proſcriptio* among the Romans. This alſo occaſions the *conſtant change* of languages; becauſe the change of cuſtom and opinions brings with it new combinations of *ideas*, which, to avoid long deſcriptions, have new names annexed to them, and ſo they become *new ſpecies* of *mixed* modes.

Of all our ſimple *ideas*, thoſe that have had moſt *mixed modes* made out of them, are *thinking*, and *motion*; which comprehend in them all action; and *power*, from whence theſe actions are conceived to flow. For actions being the great buſineſs of mankind, it is no wonder, if the ſeveral modes of thinking and motion ſhould be taken notice of, the *ideas* of them obſerved and laid up in memory, and have names aſſigned them. For without ſuch *complex ideas* with names to them, men could not eaſily hold any communication about them. Of this kind are the modes of actions diſtinguiſhed by their *cauſes*, *means*, *objects*, *ends*, *inſtruments*, *time*, *place*, and other circumſtances; as alſo of the powers fitted for thoſe actions: thus *boldneſs* is the power to do or ſpeak what we intend, without fear or diſorder; which power of doing any thing, when it has been acquired by the frequent doing the ſame thing, is that *idea* we call *habit*; when forward, and ready upon every occaſion, to break into action, we call it *diſpoſition*: thus *teſtineſs* is a diſpoſition or aptneſs to be angry.

Power being the ſource of all action, the ſubſtances wherein theſe powers are, when they exert this power, are called *cauſes*; and the ſubſtances thereupon produced, or the ſimple *ideas* introduced into any ſubject, *effects*. The efficacy whereby the new ſubſtance or *idea* is produced, is called, in the ſubject exerting that power, *action*; in the ſubject, wherein any ſimple *idea* is changed, or produced, *paſſion*: Which efficacy, in *intellectual agents*, we can conceive to be nothing elſe but modes of thinking and willing; in *corporeal agents*, nothing elſe but modifications of motion.

Of our complex ideas of ſubſtances.

THE mind obſerving ſeveral ſimple *ideas* to go conſtantly together, which being preſumed to belong to one thing, are called, ſo united in one ſubject, by one name, which we are apt afterward to talk of and conſider as one ſimple *idea*, which indeed is a complication of many *ideas* together. We imagine not theſe ſimple *ideas* to ſubſiſt by themſelves; but ſuppoſe ſome *ſubſtratum* wherein they ſubſiſt, which we call *ſubſtance*. The *idea* of pure ſubſtance is nothing but the ſuppoſed (but unknown) ſupport of theſe qualities, which are capable of producing ſimple *ideas* in us.

The *ideas* of *particular circumſtances* are compoſed out of this obſcure and general *idea* of ſubſtance, together with ſuch combinations of ſimple *ideas* as are obſerved to exiſt together, and ſupoſed to flow from the internal conſtitution and unknown eſſence of that ſubſtance. Thus we come by the *ideas* of *man*, *horſe*, *gold*, &c. Thus the ſenſible qualities of *iron*, or a *diamond*, make the complex *ideas* of thoſe ſubſtances, which a ſmith or a jeweller commonly knows better than a philoſopher.

The ſame happens concerning the operations of the mind, *viz. thinking*, *reaſoning*, &c. which we concluding not to ſubſiſt by themſelves, nor apprehending how they can belong to body, or be produced by it, we think them

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them the actions of ſome other ſubſtance, which we call *ſpirit*; of whoſe ſubſtance or nature we have as clear a notion as of that of body; the one being but the ſuppoſed *ſubſtratum* of the ſimple *ideas* we have from without, as the other of thoſe operations which we experiment in ourſelves within: So that the *idea* of *corporeal ſubſtance* in matter, is as remote from our conceptions as that of *ſpiritual ſubſtance*.

Hence we may conclude, that he has the perfecteſt *idea* of any particular ſubſtance, who has collected moſt of thoſe ſimple *ideas* which do exiſt in it; among which we are to reckon its *active powers* and *paſſive capacities*, though not ſtrictly *ſimple ideas*.

Secondary qualities, for the moſt part, ſerve to diſtinguiſh ſubſtances. For our ſenſes fail us in the diſcovery of the *bulk*, *figure*, *texture*, &c. of the minute parts of bodies, on which their real conſtitutions and differences depend; and ſecondary qualities are nothing but powers, with relation to our ſenſes. The *ideas* that make our complex ones of corporeal ſubſtances, are of three ſorts: *Firſt*, The *ideas* of primary qualities of things, which are diſcovered by our ſenſes; ſuch are *bulk*, *figure*, *motion*, &c. *Secondly*, The ſenſible ſecondary qualities; which are nothing but powers to produce ſeveral *ideas* in us by our ſenſes. *Thirdly*, The aptneſs we conſider in any ſubſtance, to cauſe or receive ſuch alterations of primary qualities, as that the ſubſtance ſo altered ſhould produce in us different *ideas* from what it did before; and they are called *active* and *paſſive powers*. All which, as far as we have any notice or notion of them, terminate in *ſimple ideas*.

Had we ſenſes acute enough to diſcern the minute particles of bodies, it is not to be doubted, but they would produce quite different *ideas* in us; as we find in viewing things with *microſcopes*. Such bodies as to our naked eyes are coloured and opaque, will through *microſcopes* appear pellucid. *Blood* to the naked eye appears all red; but by a good *microſcope* we ſee only ſome red globules ſwimming in a tranſparent liquor.

Beſides theſe complex *ideas* we have of material ſubſtances; by the ſimple *ideas* taken from the operations of our own minds, which we experiment in ourſelves, as *thinking*, *underſtanding*, *willing*, *knowing*, &c. co-exiſting in the ſame ſubſtance, we are able to frame the complex *idea* of a *ſpirit*. And this *idea* of an *immaterial ſubſtance*, is as clear as that we have of a *material*. By joining theſe with ſubſtance, of which we have no diſtinct *idea*, we have the *idea* of a *ſpirit*: And by putting together the ideas of coherent ſolid parts, and power of being moved, joined with ſubſtance, of which likewiſe we have no poſitive *idea*, we have the *idea* of *matter*. The one is as clear and diſtinct as the other. The ſubſtance of *ſpirit* is unknown to us; and ſo is the ſubſtance of *body* equally unknown to us. Two primary qualities or properties of body, *viz.* *ſolid coherent parts*, and *impulſe*, we have diſtinct clear *ideas* of: So likewiſe have we of two primary qualities or properties of ſpirit, viz. *thinking*, and a *power of action*. We have alſo clear and diſtinct *ideas* of ſeveral qualities inherent in bodies, which are but the various modifications of the extenſion of cohering ſolid parts and their motion. We have likewiſe the *ideas* of the ſeveral modes of thinking, *viz.* Believing, doubting, hoping, fearing, &c. as alſo of willing and moving the body conſequent to it.

Of relation.

THERE is another ſet of *ideas* which the mind gets from the *comparing of one thing with another*. When the mind ſo conſiders one thing, that it does as it were bring it to and ſet it by another, and carry its view from one to the other, this is *relation* or *reſpect*; and the denominations given to things intimating that reſpect, are what we call *relatives*, and the things ſo brought together *related*. Thus when I call CAJUS, *huſband*, or *whiter*, I intimate ſome other perſon, or thing, in both caſes, with which I compare him. Any of our *ideas* may be the foundation of relation.

Where languages have failed to give correlativen ames, there the relation is not ſo eaſily taken notice of: As in *concubine*, which is a relative name as well as *wife*.

The *ideas* of relation may be ſame in thoſe men who have far different *ideas* of the things that are related. Thus thoſe who have different *ideas* of *man*, may agree in that of *father*.

There is no *idea* of any kind, which is not capable of an almoſt infinite number of conſiderations, in reference to other things; and therefore this makes no ſmall part of mens words and thoughts. Thus one ſingle man may at once ſuſtain the relations of *father*, *brother*, *ſon*, *huſband*, *friend*, *ſubject*, *general*, *European*, *Engliſhman*, *Iſlander*, *maſter*, *ſervant*, *bigger*, *leſs*, &c. to an almoſt infinite number; he being capable of as many relations, as there may be occaſions of comparing him to other things in any manner of agreement, diſagreement, or reſpect whatſoever.

Of cauſe and effect, and other relations.

THE *ideas* of *cauſe* and *effect* we get from our obſervation of the *viciſſitude of things*, while we perceive ſome qualities or ſubſtances begin to exiſt, and that they receive their exiſtence from the due application and operation of other beings: That which *produces*, is the *cauſe*; that which is *produced*, the *effect*. Thus *fluidity* in wax is the effect of a certain degree of heat, which we obſerve to be conſtantly produced by the application of ſuch heat.

We diſtinguiſh the originals of things into two ſorts.

Firſt, When the thing is wholly made new, ſo that no part thereof did ever exiſt before, as when a new particle of matter doth begin to exiſt which had before no being, it is called *creation*.

Secondly, When a thing is made up of particles which did all of them before exiſt, but the thing ſo conſtituted of pre exiſting particles, which all together make up ſuch a collection of ſimple *ideas*, had not any exiſtence before, as this *man*, this *egg*, this *roſe*, &c. this, when referred to a ſubſtance produced in the ordinary courſe of nature by an internal principle, but ſet on work by ſome external agent, and working by inſenſible ways which we perceive not, is called *generation*: When the cauſe is extrinſical, and the effect produced by a ſenſible ſeparation, or juxta-poſition of diſcernible parts, we call it *making*: and ſuch are all artificial things. When any ſimple *idea* is produced,

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duced, which was not in that ſubject before, we call it *alteration*.

The denominations of things taken from *time*, are for the moſt part only relations. Thus when it is ſaid that Queen *Elizabeth* lived ſixty-nine, and reigned forty-five years, no more is meant, than that the duration of her exiſtence was equal to ſixty-nine, and of her government to forty-five annual revolutions of the ſun.

Young and *old*, and other words of time, that are thought to ſtand for poſitive *ideas*, are indeed relative; and intimate a relation to a certain length of duration, whereof we have the *idea* in our minds. Thus we call a man young or old, that has lived little or much of that time that men uſually attain to. This is evident from our application of theſe names to other things; for a *man* is called young at twenty, but a *horſe* old, *&c.* The ſun and ſtars we call not old at all, becauſe we know not what period God has ſet to that ſort of beings.

There are other *ideas*, that are truly *relative*, which we ſignify by names that are thought *poſitive* and *abſolute*; ſuch as *great* and *little*, *ſtrong* and *weak*. The things thus denominated, are referred to ſome ſtandards, with which we compare them. Thus we call an *apple great*, that is bigger than the ordinary ſort of thoſe we have been uſed to; and a man *weak*, that has not ſo much ſtrength or power to move, as men uſually have.

Of identity and diverſity.

ANOTHER occaſion the mind takes of comparing, is the very *being of things*. When conſidering a thing as exiſting at any certain time, or place, and comparing it with itſelf as exiſting at any other time, *&c.* it forms the *ideas* of *identity* and *diverſity*. When we ſee any thing in any certain time and place, we are ſure it is that very thing, and can be no other, how like ſoever it may be in all other reſpects.

We conceiving it impoſſible that two things of the ſame kind ſhould exiſt together in the ſame place, we conclude, that whatever exiſts any where at the ſame time, excludes all of the ſame kind, and is there itſelf alone. When therefore we demand whether any thing be the *ſame*, or no, it refers always to ſomething that exiſted ſuch a time, in ſuch a place, which it was certain at that inſtant was the ſame with itſelf and no other.

We have *ideas* of three ſorts of ſubſtances: 1ſt, Of *God*; 2dly, *Finite intelligences*; 3dly, *Bodies*.

Firſt, God being eternal, unalterable, and every where, concerning his *indentity* there can be no doubt.

Secondly, Finite ſpirits having had their determinate time and place of beginning to exiſt, the relation to that time and place will always determine to each its *identity*, as long as it exiſts.

Thirdly, The ſame will hold of every particle of matter to which no addition or ſubſtraction is made. Theſe three exclude not one another out of the ſame place, yet each exclude thoſe of the ſame kind out of the ſame place.

The identity and diverſity of *modes* and *relations* are determined after the ſame manner that ſubſtances are; only the actions of finite beings, as *motion* and *thought*, conſiſting in ſucceſſion, they cannot exiſt in different times and places as permanent beings: for no motion or thought, conſidered as at different times, can be the ſame, each part thereof having a different beginning of exiſtence.

From whence it is plain, that exiſtence itſelf is the *principium individuationis*, which determinates a being to a particular time and place incommunicable to two beings of the ſame kind. Thus, ſuppoſe an *atom* exiſting in a determined time and place; it is evident that, conſidered in any inſtant, it is the ſame with itſelf, and will be ſo as long as its exiſtence continues. The ſame may be ſaid of two, or more, or any number of particles, whilſt they continue together. The *maſs* will be the ſame, however jumbled: but if one atom be taken away, it is not the ſame maſs.

In *vegetables*, the identity depends not on the ſame maſs, and is not applied to the ſame thing. The reaſon of this, is the difference between an animate body and maſs of matter; *this* being only the coheſion of particles any how united; *the other*, ſuch a diſpoſition, an organization of parts, as is fit to receive and diſtribute nouriſhment, ſo as to continue and frame the wood, bark, leaves, *&c.* (of an *oak*, for inſtance) in which conſiſts the vegetable life. That therefore which has ſuch an organization of parts partaking of one common life, continues to be the ſame *plant*, though that life be communicated to new particles of matter, vitally united to the living plant. The caſe is not ſo much different in *brutes*, but that any one may hence ſee what makes an *animal*, and continues it the *ſame*.

The identity of the *ſame man* likewiſe conſiſts in a participation of the ſame continued life in ſucceeding particles of matter vitally united to the ſame organized body.

To underſtand *identity* aright, we muſt conſider what *idea* the word it is applied to ſtands for; it being one thing to be the *ſame ſubſtance*, another the *ſame man*, and a third the *ſame perſon*.

An *animal* is a living organized body; and the ſame animal is the ſame continued life communicated to different particles of matter, as they happen ſucceſſively to be united to that organized living body; and our notion of *man* is but of a particular ſort of animal.

Perſon ſtands for an intelligent being, that reaſons and reflects, and can conſider itſelf the ſame thing in different times and places; which it doth by that *conſciouſneſs* that is inſeparable from thinking. By this every one is to himſelf what he calls *ſelf*, without conſidering whether that *ſelf* be continued in the ſame or divers ſubſtances. In this conſiſts *perſonal identity*, or the ſameneſs of a rational being; and ſo far as this conſciouſneſs extends backward to any paſt action or thought, ſo far reaches the identity of that perſon. It is the ſame *ſelf* now, it was then: And it is by the ſame *ſelf*, with this preſent one that now reflects on it, that that action was done.

Self is that conſcious thinking thing, whatever ſubſtance it matters not, which is conſcious of pleaſure or pain, capable of happineſs or miſery; and ſo is concerned for itſelf as far as that conſciouſneſs extends. That with which the conſciouſneſs of this preſent thinking thing can join itſelf, makes the ſame perſon, and is one ſelf with it; and ſo attributes to itſelf and owns all the actions of that thing as its own, as far as that conſciouſneſs reaches.

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This *perſonal identity* is the object of reward and puniſhment, being that by which every one is concerned for himſelf. If the *conſciouſneſs* went along with the little finger, when that was cut off, it would be the ſame ſelf that was juſt before concerned for the whole body.

If the ſame *Socrates*, waking and ſleeping, did not partake of the ſame conſciouſneſs, they would not be the ſame *perſon*. *Socrates* waking, could not be in juſtice accountable for what *Socrates* ſleeping did, no more than one *twin* for what his brother *twin* did becauſe their outſides were ſo like that they could not be diſtinguiſhed.

But ſuppoſe I wholly loſe the memory of ſome parts of my life, beyond a poſſibility of retrieving them, ſo that I ſhall never be conſcious of them again: Am I not the *ſame perſon* that did thoſe actions, though I have now forgot them? I anſwer, that we muſt here take notice what the word *I* is applied to, which in this caſe is the man only: And the ſame man being preſumed to be the ſame perſon, *I* is eaſily here ſuppoſed to ſtand alſo for the ſame perſom. But if it be poſſible for the ſame man to have diſtinct incommunicable conſciouſneſs at different times, it is paſt doubt the ſame man would, at different times, make different perſons. Which we ſee is the ſenſe of mankind in the ſolemneſt declaration of their opinions, human laws not puniſhing the mad man for the ſober man's actions, nor the ſober man for what the mad man did; thereby making them two perſons. Thus we ſay in *Engliſh*, ſuch a one *is not himſelf*, or is *beſides himſelf*; in which phraſes it is inſinuated, that *ſelf* is changed, and the *ſelf-ſame perſon* is no longer in that man.

But is not a man drunk or ſober the ſame perſon? Why elſe is he puniſhed for the ſame fact he commits when drunk, though he be never afterwards conſcious of it? Juſt as much the ſame perſon, as a man that walks and does other things in his ſleep is the ſame perſon, and is as anſwerable for any miſchief he ſhall do in it. Human laws puniſh both with a juſtice ſuitable to their way of knowledge: Becauſe in theſe caſes they cannot diſtinguiſh certainly what is real, and what is counterfeit. And ſo the ignorance in drunkenneſs or ſleep, is not admitted as a plea: For though puniſhment be annexed to perſonality, and perſonality to conſciouſneſs; and the drunkard, perhaps, is not conſcious of what he did; yet human judicatures juſtly puniſh him, becauſe the fact is proved againſt him, but want of conſciouſneſs cannot be proved for him.

To conclude: Whatever ſubſtance begins to exiſt, it muſt during its exiſtence be the ſame. Whatever compoſitions of ſubſtances begin to exiſt, during the union of thoſe ſubſtances, the concrete muſt be the ſame. Whatſoever mode begins to exiſt, during its exiſtence it is the ſame. And ſo if the compoſition be of diſtinct ſubſtances, and different modes, the ſame rule holds.

Of other relations.

All ſimple *ideas*, wherein are parts or degrees, afford an occaſion of comparing the ſubjects wherein they are to one another, in reſpect of thoſe ſimple *ideas*. As *whiter*, *ſweeter*, *more*, *leſs*, &c. Theſe depending on the equality and exceſs of the ſame ſimple *ideas*, in ſeveral ſubjects, may be called *proportional relations*.

Another occaſion of comparing things is taken from the circumſtances of their origin, as *father*, *ſon*, *brother*, &c. Theſe may be called *natural relations*.

Sometimes the foundation of conſidering things, is ſome act whereby any one comes by a moral right, power, or obligation to do ſomething: Such are *general*, *captain*, *burgher*; theſe are *inſtituted* and *voluntary relations*, and may be diſtinguiſhed from the *natural*, in that they are alterable and ſeparable from the perſons to whom they ſometimes belonged, though neither of the ſubſtances ſo related be deſtroyed. But natural relations are not alterable, but are as laſting as their ſubjects.

Another relation is the conformity or diſagreement of mens voluntary actions to a rule to which they are referred, and by which they are judged off: Theſe may be called *moral relations*. It is this conformity or diſagreement of our actions to ſome law (whereby good or evil is drawn on us from the will and power of the law-maker, and is what we call *reward* or *puniſhment*) that renders our actions morally good or evil.

Of theſe moral *rules* or *laws*, there ſeem to be three ſorts, with their different enforcements: firſt, The *divine law*; ſecondly, *Civil law*; thirdly, *The law of opinion* or *reputation*. By their relation to the firſt, our actions are either *ſins* or *duties*; to the ſecond, *criminal* or *innocent*; to the third, *virtues* or *vices*.

Firſt, The *divine law*, is that law which God has ſet to the actions of men, whether promulgated to them by the light of nature, or the voice of revelation.

That God has given a law to mankind, ſeems undeniable; ſince he has, *firſt*, A right to do it; we are his creatures. *Secondly*, Goodneſs and wiſdom, to direct our actions to what is beſt. *Thirdly*, Power to enforce it by reward, and puniſhment of infinite weight and duration. This is the only true touch-ſtone of moral rectitude; and by which men judge of the moſt conſiderable moral good or evil of their actions; that is, whether, as duties or ſins, they are like to procure to them happineſs or miſery from the hands of the Almighty.

Secondly, The *civil law* is the rule ſet by the commonwealth to the actions of thoſe that belong to it. This law nobody over-looks; the rewards and puniſhments being ready at hand to enforce it, extending to the protecting or taking away of the life, liberty, and eſtate of thoſe who obſerve or diſobey it.

Thirdly, The law of *opinion*, or *reputation*. *Virtue* and *vice* are names ſuppoſed every where to ſtand for actions in their own nature right and wrong. As far as they are really ſo applied, they ſo far are coincident with the divine law. But it is viſible that theſe names in the particular inſtances of their application, through the ſeveral nations and ſocieties of men, are conſtantly attributed only to ſuch actions as in each country and ſociety are in reputation or diſcredit. So that the meaſure of what is every where called and eſteemed virtue and vice, is the approbation or diſlike, praiſe or blame, which by a tacit conſent eſtabliſhes itſelf in the ſocieties and tribes of men in the world;

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world; whereby ſeveral actions come to find credit or diſgrace amongſt them, according to the judgment, maxims, or faſhions of the place.

That this is ſo, appears hence: That though that paſſes for virtue in one place, which is elſewhere accounted vice, yet every where *virtue* and *praiſe*, *vice* and *blame*, go together: *Virtue* is every where that which is thought praiſe-worthy; and nothing elſe but that which has the allowance of public eſteem, is called *virtue*. Theſe have ſo cloſe an alliance, that they are often called by the ſame name.

It is true, virtue and vice do, in a great meaſure, every where correſpond with the unchangeable rule of right and wrong, which the laws of God have eſtabliſhed; becauſe the obſervation of theſe laws viſibly ſecures and advances the general good of mankind, and the neglect of them breeds miſchief and confuſion: And therefore men, without renouncing all ſenſe and reaſon, and their own intereſt, could not generally miſtake in placing their commendation and blame on that ſide that deſerved it not.

They who think commendation and diſgrace not ſufficient motives to engage men to accommodate themſelves to the opinions and rules of thoſe with whom they converſe, ſeem little ſkilled in the hiſtory of mankind; the greateſt part whereof govern themſelves chiefly by this *law of faſhion*.

The penalties that attend the breach of God's laws are ſeldom ſeriouſly reflected on; and thoſe that do reflect on them entertain thoughts of future reconciliation; and for the puniſhment due from the laws of the commonwealth, men flatter themſelves with the hopes of impunity: But no man eſcapes cenſure and diſlike, who offends againſt faſhion; nor is there one of ten thouſand ſtiff and inſenſible enough, to bear up under the conſtant diſlike and condemnation of his own club.

Morality then is nothing but a relation to theſe laws or rules: And theſe rules being nothing but a collection of ſeveral ſimple *ideas*, the conformity thereto is but ſo ordering the action, that the ſimple *ideas* belonging to it may correſpond to thoſe which the law requires. By which we ſee, how moral beings and notions are founded on, and terminated in the ſimple *ideas* of ſenſation and reflection. For example; let us conſider the complex *idea* ſignified by the word *murder*. Firſt, from reflection, we have the *ideas* of *willing*, *conſidering*, *purpoſing*, *malice*, &c. alſo of *life*, *perception*, and *ſelf-motion*. Secondly, from ſenſation, we have the *ideas* of *man*, and of ſome action whereby we put an end to that perception and motion in the man: All which ſimple *ideas* are comprehended in the word *murder*.

This collection of ſimple *ideas* being found to agree or diſagree with the eſteem of the country I have been bred in, and to be held worthy of praiſe or blame, I call the action *virtuous* or *vicious*. If I have the will of a ſupreme inviſible Law-maker for my rule; then as I ſuppoſe the action commanded or forbidden by *God*, I call it good or evil, *ſin* or *duty*: If a compare it with the civil law of my country, I call it *lawful* or *unlawful*, a crime or no crime.

Moral actions may be conſidered two ways:

Firſt, As they are in themſelves a collection of ſimple *ideas*; in which ſenſe, they are poſitive abſolute *ideas*.

Secondly, As *good* or *bad*, or *indifferent*: In this reſpect they are *relative*, it being their conformity or diſagreeement with ſome rule that makes them ſo. We ought carefully to diſtinguiſh between the poſitive *idea* of the action, and the reference it has to a rule: Both which are commonly comprehended under one name, which often occaſions confuſion, and miſleads the judgment.

Thus the taking from another what is his, without his conſent, is properly called *ſtealing*: But that name being commonly underſtood to ſignify alſo the moral pravity of the action, men are apt to condemn whatever they hear called *ſtealing* as an ill action diſagreeing with the rule of right. And yet the private taking away his ſword from a madman, to prevent his doing miſchief, though it be properly denominated *ſtealing*, as the name of ſuch a *mixed mode*, yet when compared to the law of God, it is no ſin or tranſgreſſion, though the name *ſtealing* ordinarily carries ſuch an intimation with it.

Of real and fantaſtical ideas.

Our *ideas*, in reference to things from whence they are taken, or which they may be ſuppoſed to repreſent, come under a *threefold* diſtinction; and are, firſt, either *real* or *fantaſtical*; ſecondly, *adequate*, or *inadequate*; thirdly, *true* or *falſe*.

Real ideas, are ſuch as have a foundation in nature, ſuch as have a conformity with the real being and exiſtence of things, or with their archetypes.

Fantaſtical are ſuch as have no foundation in nature, nor any conformity with that reality of being to which they are referred as to their *archetypes*. By examining the ſeveral ſorts of *ideas* we ſhall find, that, firſt our *ſimple ideas* are all real; not that they are images or repreſentations of what does exiſt, but as they are the certain effects of powers in things without us, ordained by our Maker to produce in us ſuch ſenſations: They are real *ideas* in us, whereby we diſtinguiſh the qualities that are really in things themſelves.

Their reality lies in the ſteady correſpondence they have with the diſtinct conſtitutions of real beings. But whether they anſwer to thoſe conſtitutions as to *cauſes* or *patterns*, it matters not; it ſuffices, that they are conſtantly produced by them.

Complex ideas being arbitrary combinations of *ſimple ideas* put together, and united under one general name, in forming of which the mind uſes its liberty, we muſt inquire which of theſe are real, and which imaginary combinations.

Firſt, Mixed modes and relations having no other reality than what they have in the minds of men, nothing elſe is required to make them real, but a poſſibility of exiſting conformable to them. Theſe *ideas* being themſelves *archetypes*, cannot differ from their *archetypes*, and ſo cannot be chimerical; unleſs any one will jumble together in them inconſiſtent *ideas*. Thoſe indeed that have names aſſigned them in any language, muſt have a conformity to the ordinary ſignification of the name that is given

given them, that they may not be thought fantaſtical.

Secondly, Our complex *ideas* of ſubſtances being made, in reference to things exiſting without us, whoſe repreſentations they are thought are no farther real, than as they are ſuch combinations of *ſimple ideas* as are really united, and co-exiſt in things without us: thoſe are fantaſtical which are made up of ſeveral *ideas* that never were found united, as *Centaur*, &c.

Of ideas adequate or inadequate.

REAL *ideas* are either *adequate* or *inadequate*. Firſt, *adequate*; which perfectly repreſent thoſe archetypes which the mind ſuppoſes them taken from, and which it makes them to ſtand for. *Secondly*, *Inadequate*; which are ſuch as do but partially or incompleatly repreſent thoſe archetypes to which they are referred. Whence it appears,

Firſt, That all our *ſimple ideas* are *adequate*; for they being but the effects of certain powers in things fitted and ordained by God to produce ſuch ſenſations in us, they cannot but be correſpondent and adequate to ſuch powers, and we are ſure they agree to the reality of things.

Secondly, Our *complex ideas of modes* being voluntary collections of *ſimple ideas*, which the mind puts together without reference to any real archetypes, cannot but be *adequate ideas*. They are referred to no other pattern, nor made by any original, but the good-liking and will of him that makes the combination. If indeed one would conform his *ideas* to thoſe which are formed by another perſon, they may be wrong or *inadequate*, becauſe they agree not to that which the mind deſigns to be their archetype and pattern; in which reſpect only any *ideas* of modes can be wrong, imperfect, or inadequate.

Thirdly, Our *ideas of ſubſtances* have in the mind a double reference: *Firſt*, They are ſometimes referred to a ſuppoſed real eſſence, of each ſpecies of things; *ſecondly*, They are deſigned for repreſentations in the mind, of things that do exiſt, by *ideas* diſcoverable in them: In both which reſpects they are *inadequate*.

Firſt, If the names of ſubſtances ſtand for things, as ſuppoſed to have certain real eſſences, whereby they are of this or that ſpecies, of which real eſſences men are wholly ignorant; it follows, that the *ideas* they have in their minds, being referred to real eſſences as *archetypes* which are unknown, they muſt be ſo far from being adequate, that they cannot be ſuppoſed to be any repreſentation of them at all. Our complex *ideas* of ſubſtances are nothing but certain collections of ſimple *ideas* that have been obſerved or ſuppoſed conſtantly to exiſt together. But ſuch a complex *idea* cannot be the real eſſence of any ſubſtance: For then the properties we diſcover in it would be deducible from it, and their neceſſary connection with it be known; as all the properties of a *triangle* depend on and are deducible from the complex *idea* of *three lines including a ſpace*: But it is certain, that in our complex *ideas* of ſubſtances are not contained ſuch *ideas* on which all other qualities that are to be found in them depend.

Secondly, Thoſe that take their *ideas* of ſubſtances from their ſenſible qualities, cannot form adequate *ideas* of them: Becauſe their qualities and powers are ſo various, that no man's complex *idea* can contain them all. Moſt of our ſimple *ideas*, whereof our complex ones of ſubſtances do conſiſt, are powers, which being relations to other ſubſtances, we cannot be ſure we know all the powers, till we have tried what changes they are fitted to give and receive from other ſubſtances in their ſeveral ways of application; which being not poſſible to be tried upon one body, much leſs upon all, it is impoſſible we ſhould have adequate *ideas* of any ſubſtance made of a collection of all its properties.

Of true and falſe ideas.

TRUTH and *falſehood*, in propriety of ſpeech, belong only to propoſitions; and when *ideas* are termed *true* or *falſe*, there is ſome ſecret or tacit propoſition, which is the foundation of that denomination. Our *ideas* being nothing but *appearances*, or *perceptions* in the mind, can, in ſtrictneſs of ſpeech, no more be ſaid to be true or falſe, than ſingle names of things can be ſaid to be true or falſe. The *idea* of *Centaur* has no more falſehood in it when it appears in our minds, than the name *Centaur* when it is pronounced or writ on paper. For truth or falſehood lying always in ſome affirmation or negation, our *ideas* are not capable, any of them, of being falſe, till the mind paſſes ſome judgment on them, that is, affirms or denies ſomething of them. In a *metaphyſical* ſenſe they may be ſaid to be true, that is, to be really ſuch as they exiſt; though in things called true, even in that ſenſe, there is perhaps a ſecret reference to our *ideas*, looked upon as the ſtandards of that truth; which amounts to a *mental propoſition*.

When the mind refers any of its *ideas* to any thing extraneous to it, they are then capable of being true or falſe: becauſe in ſuch a reference, the mind makes a tacit ſuppoſition of their conformity to that thing; which ſuppoſition, as it is true or falſe, ſo the *ideas* themſelves come to be denominated. This happens in theſe caſes:

1*ſt*, When the mind ſuppoſes its *idea* conformable to that in other mens minds, called by the ſame name, ſuch as that of *juſtice*, *virtue*, &c.

2*dly*, When the mind ſuppoſes any *idea* conformable to ſome real exiſtence. Thus, that of *Man* is true, that of *Centaur* falſe; the one having a conformity to what has really exiſted, the other not.

3*dly*, When the mind refers any of its *ideas* to that real conſtitution and eſſence of any thing whereon all its properties depend: and thus the greateſt part, if not all our *ideas of ſubſtances* are falſe.

As to the *firſt*, when we judge of our *ideas* by their conformity to thoſe of other men, they may be any of them falſe: but ſimple *ideas* are leaſt liable to be ſo miſtaken. We ſeldom miſtake green for blue, or bitter for ſweet; much leſs do we confound the names belonging to different ſenſes, and call a *colour* by the name of a *taſte*. Complex *ideas* are much more liable to falſhood in this particular; and thoſe of mixed modes more than ſubſtances: becauſe in ſubſtances, their ſenſible qualities ſerve, for the moſt part, to diſtinguiſh them clearly; but in mixed modes we are more uncertain, and we may call that *juſtice* which ought to be called by another name. The reaſon

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reason of this is, that the abstract *ideas* of mixed modes being mens voluntary combinations of such a precise collection of simple *ideas*, we have nothing else to refer our *ideas* of mixed modes as standards to, but the *ideas* of those who are thought to use names in their proper significations: and so as our *ideas* conform or differ from them, they pass for true or false.

As to the *second*, When we refer our *ideas* to the real existence of things, none can be termed false but our complex *ideas* of substances: for our simple *ideas* being nothing but perceptions in us answerable to certain powers in external objects, their truth consists in nothing but such appearances as are produced in us suitable to those powers: neither do they become liable to the imputation of falsehood, whether we judge these *ideas* to be in the things themselves, or no: for God having set them as marks of distinguishing things, that we may be able to discern one thing from another, and thereby chuse them as we have occasion, it alters not the nature of our simple *ideas*, whether we think the *idea* of *blue* (for instance) to be in the violet itself, or in the mind only: and it is equally from that appearance to be denominated *blue*, whether it be that real colour, or only a peculiar texture in it, that causes in us that *idea*; since the name *blue* notes properly nothing but that mark of distinction that is in a violet, discernible only by our eyes, whatever it consists in.

Neither would our simple *ideas* be *false*, if by the different structure of our organs it were so ordered, that the same object should produce in several mens minds different *ideas*: for this could never be known, since objects would operate constantly after the same manner. It is most probable, nevertheless, that the *ideas* produced by the same objects in different mens minds, are very near and undiscernibly like. Names of simple *ideas* may be misapplied; as a man, ignorant in the *English* tongue, may call *purple*, *scarlet*: but this makes no falsehood in the *idea*.

Complex *ideas* of modes cannot be false, in reference to the essence of any thing really existing; because they have no reference to any pattern existing, or made by nature.

Our complex *ideas* of substances, being all referred to patterns in things themselves, may be false. They are so, *1st*, When looked upon as representations of the unknown essences of things: *2dly*, When they put together simple *ideas* which in the real existence of things have no union; as in *centaur*. *3dly*, When from any collection of simple *ideas*, that do always exist together, there is separated, by a direct negation, any one simple *idea* which is constantly joined with them. Thus, if from extension, solidity, fixedness, malleableness, fusibility, &c. we remove the colour observed in *gold*: If this *idea* be only left out of the complex one of *gold*, it is to be looked on as an inadequate and imperfect, rather than a false one; since though it contains not all the simple *ideas* that are united in nature, yet it puts none together but what do really exist together.

Upon the whole, our *ideas*, as they are considered by the mind, either in reference to the proper signification of their names, or in reference to the reality of things, may more properly be called *right* or *wrong ideas*, according as they agree or disagree to those patterns to which they are referred. The *ideas* that are in mens minds, simply considered, cannot be wrong, unless *complex ideas*, wherein inconsistent parts are jumbled together. All other *ideas* are in themselves right, and the knowledge about them right and true knowledge. But when we come to refer them to any patterns, or archetypes, then they are capable of being wrong, as far as they disagree with such archetypes.

Of the association of ideas.

Some of our *ideas* have a natural correspondence and connection one with another: It is the office and excellency of our reason to trace these, and hold them together in that union and correspondence which is founded in their peculiar beings. Besides this, there is another connection of *ideas* wholly owing to chance or custom: *Ideas* that in themselves are not at all of kin, come to be so united in some mens minds, that it is very hard to separate them; they always keep company, and the one no sooner comes into the understanding, but its associate appears with it; and if they are more than two, the whole gang always inseparably shew themselves together. This strong combination of *ideas*, not allied by nature, the mind makes in itself either voluntarily, or by chance: And hence it comes in different men to be very different, according to their different *inclinations*, *educations*, *interests*, &c. Custom settles habits of thinking in the understanding, as well as of determining in the will, and of motions in the body; all which seem to be but trains of motion in the animal spirits, which, once set a going, continue on in the same steps they have been used to; which by often treading are worn into a smooth path, and the motion in it becomes easy, and, as it were, natural. As far as we can comprehend thinking, thus *ideas* seem to be produced in our minds; or if they are not, this may serve to explain their following one another in an habitual train, when once they are put into that tract, as well as it does to explain such motions of the body.

This connection in our minds of *ideas*, in themselves loose and independent one of another, is of so great force to set us awry in our actions, as well moral as natural, passions, reasonings, and notions themselves, that perhaps there is not any one thing that deserves more to be looked after. Thus the *ideas* of *goblins* and *sprights* have really no more to do with darkness than light; yet let but a foolish maid inculcate these often on the mind of a child, and raise them there together, possibly he shall never be able to separate them again so long as he lives, but darkness shall ever afterwards bring with it those frightful *ideas*. A man has suffered pain or sickness in any place; he saw his friend die in such a room; though these have in nature nothing to do one with another, yet when the *idea* of the *place* occurs to his mind, it brings that of the pain and displeasure with it; he confounds him in his mind, and can as little bear the one as the other.

Intellectual habits and defects this way contracted, are not less frequent and powerful, though less observed. Let the *ideas* of *being* and *matter* be strongly joined either by education or much thought, whilst these are still combined in the mind, what notions, what reasonings will

there be about ſeparate ſpirits? Let cuſtom from the very childhood have joined figure and ſhape to the *idea* of God, and what abſurdities will that mind be liable to about the Deity? Let the *idea* of *infallibility* be joined to any perſon, and theſe two conſtantly together poſſeſs the mind; and then one body in two places at once ſhall be ſwallowed for a certain truth, whenever that imagined infallible perſon dictates, and demands aſſent without inquiry.

Some ſuch wrong combinations of *ideas* will be found to eſtabliſh the irreconcileable oppoſition between different ſects of philoſophy and religion: for we cannot imagine every one of their followers to impoſe wilfully on himſelf, and knowingly refuſe truth offered by plain reaſon. Intereſt, though it does a great deal in the caſe, yet cannot be thought to work whole ſocieties of men to ſo univerſal a perverſeneſs, as that every one of them ſhould knowingly maintain falſhood; ſome at leaſt muſt be allowed to do what all pretend to, *i e.* to purſue truth ſincerely. That therefore which captivates their reaſons, and leads men of ſincerity blindfold from common ſenſe, will, when examined, be found to be what we are ſpeaking of: ſome independent *ideas*, are by education, cuſtom, and the conſtant din of their party, ſo coupled in their minds, that they always appear there together; and they can no more ſeparate them in their thoughts, than if they were but one *idea*; and they operate as if they were ſo. This gives ſenſe to jargon, demonſtration to abſurdities, and conſiſtency to nonſenſe, and is the foundation of the greateſt errors in the world. The confuſion of two different *ideas*, which a cuſtomary connection of them in their minds hath to them in effect made but one, cannot but fill mens heads with falſe views, and their reaſonings with falſe conſequences.

Of knowledge in general.

SINCE the mind, in all its thoughts and reaſonings, has no other immediate object but its own *ideas*, which alone it does or can contemplate, it is evident that our knowledge is only converſant about them. *Knowledge* then ſeems to be nothing but the perception of the connection and agreement, or diſagreement and repugnancy of any of our *ideas*: where this perception is, there is *knowledge*; and where it is not, there, though we fancy, gueſs, or believe, yet we always come ſhort of *knowledge*. When we know that *white* is not *black*, what do we but perceive that theſe two *ideas* do not agree? Or that the three angles of a *triangle*, are equal to two right ones; what do we more but perceive that equality to two right ones does neceſſarily agree to, and is inſeparable from the three angles of a triangle? But to underſtand a little more diſtinctly wherein this agreement or diſagreement conſiſts, we may reduce it all to theſe *four ſorts*: 1ſt. *Identity* or *diverſity*; 2dly, *Relation*; 3dly, *Coexiſtence*; 4thly, *Real exiſtence*.

1. *Identity* or *diverſity*. It is the firſt act of the mind, *to perceive its* ideas; and ſo far as it perceives them, to know each what it is, and thereby to perceive their difference, that is, the one not to be the other: by this the mind clearly perceives each *idea* to agree with itſelf, and to be what it is; and all diſtinct *ideas* to diſagree. This it does without any pains or deduction, by its natural power of perception and diſtinction. This is what men of art have reduced to thoſe general rules, *viz. what is, is*; and, *it is impoſſible for the ſame thing to be and not to be*. But no *maxim* can make a man know it clearer, that *round* is not *ſquare*, than the bare perception of thoſe two *ideas*, which the mind at firſt ſight perceives to diſagree.

2. The next ſort of agreement or diſagreement the mind perceives in any of its *ideas*, may be called *relative*, and is nothing but the perception of the relation between any two *ideas* of what kind ſoever; that is, their agreement or diſagreement one with another in ſeveral ways the mind takes of compa ing them.

3. The third ſort of agreement or diſagreement to be found in our ideas, is, *coexiſtence* or *non-coexiſtence* in the ſame ſubject; and this belongs particularly to ſubſtances. Thus when we pronounce concerning *gold*, that it is fixed, it amounts to no more but this, that fixedneſs, or a power to remain in the fire unconſumed, is an *idea* that always accompanies that particular ſort of *yellowneſs*, *weight*, *fuſibility*, &c. which make our complex *idea* ſignified by the word *gold*.

4. The fourth ſort, is that of actual and *real exiſtence* agreeing to any *idea*. Within theſe four ſorts of agreement or diſagreement, is contained all the knowledge we have, or are capable of. For all that we know or can affirm concerning any *idea*, is, That it is, or is not the ſame with ſome other; as, that *blue is not yellow*: That it does, or does not coexiſt with another in the ſame ſubject; as, that *iron is ſuſceptible of magnetical impreſſions*; That it has that or this relation to ſome other *ideas*; as, That *two triangles, upon equal baſes between two parallels, are equal*: or, that it has a real exiſtence without the mind; as, *that God is*.

There are ſeveral ways wherein the mind is poſſeſſed of truth, each of which is called knowledge. *Firſt*, There is *actual knowledge*, when the mind has a preſent view of the agreement or diſagreement of any of its *ideas*, or of the relation they have one with another. *Secondly*, A man is ſaid to know any propoſition, when having once evidently perceived the agreement or diſagreement of the *ideas* whereof it conſiſts, and ſo lodged it in his memory, that whenever it comes to be reflected on again, the mind aſſents to it without doubt or heſitation, and is certain of the truth of it. And this may be called *habitual knowledge*. And thus a man may be ſaid to know all thoſe truths which are lodged in his memory by a foregoing, clear, and full perception.

Of *habitual knowledge* there are two ſorts: The one is of ſuch truths laid up in the memory, as whenever they occur to the mind, it actually perceives the relation that is between thoſe *ideas*. And this is in all thoſe truths, where the *ideas* themſelves, by an immediate view, diſcover their agreement or diſagreement one with another. The other is of ſuch truths, whereof the mind having been convinced, it retains the memory of the conviction, without the proofs. Thus a man that remembers certainly, that he once perceived the demonſtration, that the three angles of a triangle are equal to two right ones, knows it to be true, when that demonſtration is gone out of

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of his mind, and poſſibly cannot be recollected: But he knows it in a different way from what he did before, namely, not by the intervention of thoſe intermediate *ideas*, whereby the agreement or diſagreement of thoſe in the propoſition was at firſt perceived, but by remembring, *i. e.* knowing that he was once certain of the truth of this propoſition, that the three angles of a triangle are equal to two right ones. The immutability of the ſame relations between the ſame immutable things, is now the *idea* that ſhews him, that if the three angles of a triangle were once equal to two right ones, they will always be ſo. And hence he comes to be certain, that what was once true, is always true; what *ideas* once agreed, will always agree; and conſequently, what he once knew to be true, he will always know to be true, as long as he can remember that he once knew it.

Of the degrees of our knowledge.

All our knowledge conſiſting in the view the mind has of its own *ideas*, which is the utmoſt light and greateſt certainty we are capable of, the *different clearneſs of our knowledge* ſeems to lie in the different way of perception the mind has of the agreement or diſagreement of any of its *ideas*.

When the mind perceives this agreement or diſagreement of two *ideas immediately* by themſelves, without the intervention of any other, we may call it *intuitive knowledge*; in which caſes the mind perceives truth, as the eye does light, only by being directed towards it. Thus the mind perceives, that *white is not black*; that *three are more than two*, and *equal to one and two*. This part of knowledge is irreſiſtible, and, like the bright ſun-ſhine, forces itſelf immediately to be perceived as ſoon as ever the mind turns its view that way. It is on this *intuition* that depends all the certainty and evidence of our other knowledge; which certainty every one finds to be ſo great, that he cannot imagine, and therefore not require a greater.

The next degree of knowledge, is, where the mind perceives not this agreement or diſagreement immediately, or by the *juxta-poſition*, as it were, of the *ideas*, becauſe thoſe *ideas* concerning whoſe agreement or diſagreement the inquiry is made, cannot by the mind be ſo put together, as to ſhew it. In this caſe the mind is fond to diſcover the agreement or diſagreement which it ſearches, by the intervention of other *ideas*: And this is that which we call *reaſoning*. And thus, if we would know the agreement or diſagreement in bigneſs, between the three angles of a triangle, and two right angles, we cannot by an immediate view and comparing them do it; becauſe the three angles of a triangle cannot be brought at once, and be compared with any other one or two angles. And ſo of this the mind has no immediate or intuitive knowledge. But we muſt find out ſome other angles, to which the three angles of a triangle have equality; and finding thoſe equal to two right ones, we come to know the equality of theſe three angles to two right ones. Thoſe intervening *ideas* which ſerve to ſhew the agreement of any two others, are called *proofs*; and where the agreement or diſagreement is by this means plainly and clearly perceived, it is called *demonſtration*. A quickneſs in the mind to find thoſe proofs, and to apply them right, is that which is called *ſagacity*.

This knowledge, though it be certain, is not ſo clear and evident as *intuitive* knowledge. It requires pains and attention, and ſteady application of mind, to diſcover the agreement or diſagreement of the *ideas* it conſiders; and there muſt be a progreſſion by ſteps and degrees, before the mind can in this way arrive at certainty. Before demonſtration there was a doubt, which, in *intuitive knowledge*, cannot happen to the mind that has its faculty of perception left to a degree capable of diſtinct *ideas*, no more than it can be a doubt to the eye (that can diſtinctly ſee *white* and *black*) whether this ink and paper be all of a colour.

Now, in every ſtep that reaſon makes in *demonſtrative knowledge*, there is an *intuitive knowledge* of that agreement or diſagreement it ſeeks with the next intermediate *idea*, which it uſes as a proof; for if it were not ſo, that yet would need a proof; ſince without the perception of ſuch agreement or diſagreement, there is no knowledge produced. By which it is evident, that every ſtep in reaſoning, that produces knowledge, has *intuitive certainty*: which when the mind perceives, there is no more required but to remember it, to make the agreement or diſagreement of the *ideas* concerning which we inquire viſible and certain. This *intuitive perception* of the agreement or diſagreement of the intermediate *ideas* in each ſtep and progreſſion of the demonſtration, muſt alſo be exactly carried in the mind; and a man muſt be ſure that no part is left out; which becauſe in long deductions the memory cannot eaſily retain, this knowledge becomes more imperfect than *intuitive*, and men often embrace falſehoods for demonſtrations.

It has been generally taken for granted, that *mathematicks* alone are capable of demonſtrative certainty. But to have ſuch an agreement or diſagreement as may be *intuitively* perceived, being not the privilege of the *ideas* of *number*, *extenſion*, and *figure* alone, it may poſſibly be the want of due method and application in us, and not of ſufficient evidence in things, that demonſtration has been thought to have ſo little to do in other parts of knowledge: For in whatever *ideas* the mind can perceive the agreement or diſagreement immediately, there it is capable of *intuitive knowledge*: And where it can perceive the agreement or diſagreement of any two *ideas*, by an *intuitive perception* of the agreement or diſagreement they have with any intermediate *ideas*, there the mind is capable of demonſtration which is not limited to the *ideas* of figure, number, extenſion, or their modes. The reaſon why it has been generally ſuppoſed to belong to them only, is, becauſe in comparing their equality or exceſs the *modes of numbers* have every the leaſt difference very clear and perceivable: And in *extenſion*, though every the leaſt exceſs is not ſo perceptible, yet the mind has found out ways to diſcover the juſt equality of two angles, extenſions, or figures; and both, that is, numbers and figures, can be ſet down by viſible and laſting marks.

But in other ſimple *ideas*, whoſe modes and differences are made and counted by degrees, and not quantity, we have not ſo nice and accurate a diſtinction of their differences, as to perceive or find ways to meaſure their juſt equality,

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equality, or the leaſt differences: For thoſe other ſimple *ideas* being appearances or ſenſations produced in us by the *ſize*, *figure*, *motion*, &c. of minute corpuſcles ſingly inſenſible, their different degrees alſo depend on the variation of ſome, or all of thoſe cauſes; which ſince it cannot be obſerved by us in particles of matter, whereof each is too ſubtile to be perceived, it is impoſſible for us to have any exact meaſures of the different degrees of theſe ſimple *ideas*. Thus, for inſtance, not knowing what number of particles, nor what motion of them, is fit to produce any preciſe degree of *whiteneſs*, we cannot demonſtrate the certain equality of any two degrees of *whiteneſs*, becauſe we have no certain ſtandard to meaſure them by, nor means to diſtinguiſh every the leaſt difference; the only help we have being from our ſenſes, which in this point fail us.

But where the difference is ſo great as to produce in the mind *ideas* clearly diſtinct, there *ideas* of *colours*, as we ſee in different kinds, *blue* and *red*, (for inſtance,) are as capable of demonſtration as *ideas* of number and extenſion. What is here ſaid of colours, holds true in all ſecondary qualities. Theſe two then, *intuition* and *demonſtration*, are the degrees of our *knowledge*; whatever comes ſhort of one of theſe, is but *faith* or *opinion*, not *knowledge*, at leaſt, in all *general truths*. There is, indeed, another perception of the mind employed about the *particular exiſtence of finite beings* without us; which going beyond probability, but not reaching to either of the foregoing degrees of certainty, paſſes under the name of *knowledge*.

Nothing can be more certain, than that the *idea* we receive from an external object is in our minds: This is *intuitive knowledge*; but whether we can thence certainly infer the exiſtence of any thing without us, correſponding to that *idea*, is that whereof ſome men think there may be a queſtion made, becauſe men may have ſuch an *idea* in their minds, when no ſuch things exiſt, no ſuch object affects their ſenſes. But its evident that we are invincibly conſcious to ourſelves of a different perception, when we look upon the *ſun* in the day, and think on it by night; when we actually taſte *wormwood*, or ſmell a *roſe*, or only think on that *ſavour* or *odour*. So that we may add to the two former ſorts of knowledge, this alſo of the exiſtence of particular external objects, by that perception and conſciouſneſs we have of the actual entrance of *ideas* from them, and allow theſe three degrees of knowledge, *viz. intuitive*, *demonſtrative*, and *ſenſitive*.

But ſince our knowledge is founded on, and employed about our *ideas* only, will it follow thence that it muſt be conformable to our *ideas*; and that where our *ideas* are clear and diſtinct, obſcure and confuſed, there our knowledge will be ſo too? *No*. For our knowledge conſiſting in the perception of the agreement or diſagreement of any two *ideas*, its clearneſs or obſcurity conſiſts in the clearneſs or obſcurity of that perception, and not in the clearneſs or obſcurity of the *ideas* themſelves. A man (for inſtance) that has a clear *idea* of the angles of a triangle, and of equality to two right ones, may yet have but an obſcure perception of their agreement; and ſo have but a very obſcure knowledge of it. But obſcure and confuſed *ideas* can never produce any clear or diſtinct knowledge; becauſe, as far as any *ideas* are obſcure or confuſed, ſo far the mind can never perceive clearly whether they agree or diſagree.

Of the extent of human knowledge.

FROM what has been ſaid concerning knowledge, it follows, *Firſt*, That we can have no knowledge farther than we have *ideas*.

Secondly, That we have no knowledge farther than we can have perception of that agreement or diſagreement of our *ideas*, either by *intuition*, *demonſtration*, or *ſenſation*.

Thirdly, We cannot have an *intuitive* knowledge that ſhall extend itſelf to all our *ideas*, and all that we would know about them, becauſe we cannot examine and perceive all the relations they have one to another, by juxtapoſition, or an immediate compariſon one with another. Thus we cannot *intuitively* perceive the equality of two extenſions, the difference of whoſe figures makes their parts incapable of an exact immediate application.

Fourthly, Our *rational* knowledge cannot reach to the whole extent of our *ideas*; becauſe between two different *ideas* we would examine, we cannot always find ſuch *proofs* as we can connect one to another, with an *intuitive knowledge* in all the parts of the deduction.

Fifthly, *Senſitive* knowledge reaching no farther than the exiſtence of things actually preſent to our ſenſes, is yet much narrower than either of the former.

Sixthly, From all which it is evident, that the *extent of our knowledge*, comes not only ſhort of the reality of *things*, but even of the extent of our own *ideas*. We have the *ideas* of a *ſquare*, a *circle*, and *equality*; and yet, perhaps, ſhall never be able to find a *circle equal to a ſquare*.

The affirmations or negations we make concerning the *ideas* we have, being reduced to the four ſorts above mentioned, *viz. identity*, *coexiſtence*, *relation*, and *real exiſtence*, we ſhall examine how far our knowledge extends in each of theſe.

Firſt, As to *identity and diverſity*, our *intuitive knowledge* is as far extended as our *ideas* themſelves; and there can be no *idea* in the mind, which it does not preſently, by an *intuitive knowledge*, perceived to be what it is, and to be different from any other.

Secondly, As to the agreement or diſagreement of our *ideas* in *coexiſtence*: In this our knowledge is very ſhort; though in this conſiſts the greateſt and moſt material part of our knowledge, concerning *ſubſtances*. For our *ideas* of *ſubſtances* being nothing but certain *collections of ſimple* ideas, *coexiſting in one ſubject*, (our *idea* of *flame*, for inſtance, is a body *hot*, *luminous*, and *moving upward*;) when we would know any thing farther concerning this, or any other ſort of ſubſtance, what do we but inquire what other qualities or powers theſe ſubſtances have, or have not? Which is nothing elſe but to know what other ſimple *ideas* do or do not *coexiſt* with thoſe that make up that complex *idea*. The reaſon of this is, becauſe the ſimple *ideas* which make up our complex *ideas* of ſubſtances, have no viſible neceſſary connection

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nection or inconſiſtence with other ſimple *ideas* whoſe coexiſtence with them we would inform ourſelves about. Theſe *ideas* being likewiſe, for the moſt part, *ſecondary qualities*, which depend upon the *primary* qualities of their minute or inſenſible parts, or on ſomething yet more remote from our comprehenſion, it is impoſſible we ſhould know which have a neceſſary union or inconſiſtency one with another, ſince we know not the root from whence they ſpring, or the ſize, figure, and texture of parts on which they depend, and from which they reſult.

Beſides this, there is no *diſcoverable connection* between any *ſecondary* quality, and thoſe *primary* qualities that it depends on. We are ſo far from knowing what figure, ſize, or motion produces (for inſtance) a *yellow colour*, or *ſweet taſte*, or a *ſharp ſound*, that we can by no means conceive how any *ſize*, *figure*, or *motion* can poſſibly produce in us the *idea* of any *colour*, *taſte*, or *ſound* whatſoever; and there is no conceivable connection between the one and the other.

Our knowledge therefore of coexiſtence reaches little farther than *experience*. Some few, indeed, of the *primary* qualities have a neceſſary dependence and viſible connection one with another; as *figure* neceſſarily ſuppoſes *extenſion*, *receiving or communicating motion by impulſe* ſuppoſes *ſolidity*. But qualities coexiſtent in any ſubject, without this dependence and connection, cannot certainly be known to coexiſt any farther than experience by our ſenſes informs us. Thus, though upon trial we find *gold* yellow, weighty, malleable, fuſible, and fixed, yet becauſe none of theſe have any evident dependence or neceſſary connection with the other, we cannot certainly know that where any *four* of theſe are, the *fifth* will be there alſo, how highly probable ſoever it may be: But the higheſt degree of *probability* amounts not to *certainty*; without which there can be no true knowledge: For this coexiſtence can be no further known, than it is perceived; and it cannot be perceived, but either, in *particular* ſubjects, by the obſervation of our ſenſes, or, in *general*, by the neceſſary connection of the *ideas* themſelves.

As to *incompatibility*, or *repugnancy to coexiſtence*, we may know that any ſubject can have of each ſort of *primary* qualities but one particular at once, one extenſion, one figure; and ſo of ſenſible *ideas*, peculiar to each ſenſe: for whatever of each kind is preſent in any ſubject, excludes all other of that ſort; for inſtance, one ſubject cannot have *two ſmells* or *two colours* at the ſame time.

As to *powers of ſubſtances*, which make a great part of our inquiries about them, and are no inconſiderable branch of our knowledge; our knowledge as to theſe reaches little farther than *experience*; becauſe they conſiſt in a texture and motion of parts which we cannot by any means come to diſcover. *Experience* is that which in this part we muſt depend on; and it were to be wiſhed that it were more improved.

As to the third ſort, the *agreement or diſagreement of our ideas in any other relation*, this is the largeſt field of knowledge, and it is hard to determinate how far it may extend. This part depending on our ſagacity in finding intermediate *ideas* that may ſhew the habitudes and relations of *ideas*, it is an hard matter to tell when we are at the end of ſuch diſcoveries. They that are ignorant of *algebra*, cannot imagine the wonders in this kind that are to be done by it; and what farther improvements and helps advantageous to other parts of knowledge the ſagacious mind of man may yet find out, it is not eaſy to determine. The *ideas* of *quantity* are not thoſe alone that are capable of demonſtration and knowledge; other, and perhaps more uſeful parts of contemplation, would undoubtedly afford us certainty, if vices, paſſions, and domineering intereſt, did not oppoſe or menace endeavours of this kind.

The *idea* of a *Supreme Being*, infinite in power, goodneſs, and wiſdom, whoſe workmanſhip we are, and on whom we depend; and the *idea* of *ourſelves*, as underſtanding rational creatures; would, if duely conſidered, afford ſuch foundations of our *duty*, and *rules of action*, as might place *morality* among the ſciences capable of demonſtration. The relations of other modes may certainly be perceived, as well as thoſe of number and extenſion. *Where there is no property, there is no injuſtice*, is a propoſition as certain as any demonſtration in *Euclid*: for the *idea* of *property* being a right to any thing; and the *idea* of *injuſtice* being the invaſion or violation of that right; it is evident, that theſe *ideas* being thus eſtabliſhed, and theſe names annexed to them, we can as certainly know this propoſition to be true, as that a *triangle has three angles equal to two right ones*. Again, *No government allows abſolute liberty*. The *idea* of *government* being the eſtabliſhment of ſociety upon certain rules or laws which require conformity to them, and the *idea* of *abſolute liberty* being for any one to do whatever he pleaſes, we are as capable of being certain of the truth of this propoſition, as of any in *mathematicks*.

What has given the advantage to the *ideas* of *quality*, and made them thought more capable of certainty and demonſtration, is,

Firſt, That they can be repreſented by ſenſible marks which have a nearer correſpondence with them than any words or ſounds. *Diagrams* drawn on paper are copies of the *ideas*, and not liable to the uncertainty that words carry in their ſignification: But we have no ſenſible marks that reſemble our *moral ideas*, and nothing but words to expreſs them by; which though when written they remain the ſame, yet the *ideas* they ſtand for may change in the ſame man; and it is very ſeldom that they are not different in different perſons.

Secondly, *Moral ideas* are commonly more complex than figures. Whence theſe two inconveniences follow: *Firſt*, That their names are of more uncertain ſignification; the preciſe collection of ſimple *ideas* they ſtand for not being ſo eaſily agreed on, and ſo the ſign that is uſed for them in communication always, and in thinking often, does not ſteadily carry with it the ſame *idea*. *Secondly*, The mind cannot eaſily retain thoſe preciſe combinations ſo exactly and perfectly as is neceſſary; in the examination of the habitudes and correſpondencies, agreements or diſagreements of ſeveral of them one with another, eſpecially where it is to be judged off by long deductions, and the intervention of ſeveral other complex *ideas*, to ſhew the agreement or diſagreement of two remote ones.

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Now one part of theſe diſadvantages in *moral ideas*, which has made them be thought not capable of demonſtration, may in a good meaſure be remedied by *definitions*, ſetting down that collection of ſimple *ideas* which every term ſhall ſtand for, and then uſing the terms ſteadily and conſtantly for that preciſe collection.

As to the fourth ſort of knowledge, *viz.* of *the real actual exiſtence of things* we have an *intuitive* knowledge of our *own exiſtence*; a *demonſtrative* knowledge of *the exiſtence of God*; and a *ſenſitive* knowledge of the *objects that preſent themſelves to our ſenſes*.

From what has been ſaid, we may diſcover the *cauſes of our ignorance*; which are chiefly theſe three: *Firſt*, Want of *ideas*: *Secondly*, Want of a diſcoverable connection beween the *ideas* we have: *Thirdly*, Want of tracing and examining our *ideas*.

Firſt, There are ſome things we are ignorant of for *want of ideas*. All the ſimple *ideas* we have are confined to the obſervations of our ſenſes, and the operations of our own minds that we are conſcious of in ourſelves. What other *ideas* it is poſſible other creatures may have, by the aſſiſtance of other ſenſes and faculties more or perfecter than we have, or different from ours, it is not for us to determine; but to ſay or think there are no ſuch, becauſe we conceive nothing of them, is no better an argument, than if a blind man ſhould be poſitive in it, that there was no ſuch thing as ſight and colours, becauſe he had no manner of *idea* of any ſuch thing. What faculties therefore other ſpecies of creatures have to penetrate into the nature and inmoſt conſtitutions of things, we know not. This we know, and certainly find, that we want other views of them, beſides thoſe we have, to make diſcoveries of them more perfect. The *intellectual* and *ſenſible* world are in this perfectly alike, that the parts which we ſee of either of them, hold no proportion with that we ſee not; and whatſoever we can reach with our eyes or our thoughts of either of them, is but a point almoſt nothing in compariſon of the reſt.

Another great cauſe of ignorance, is the *want of ideas that we are capable of*. This keeps us in ignorance of things we conceive capable of being known. Bulk, figure, and motion we have *ideas* of; yet not knowing what is the particular bulk, motion, and figure of the greateſt part of the bodies of the univerſe, we are ignorant of the ſeveral powers, efficacies, and ways of operation, whereby the effects we daily ſee are produced. Theſe are hid from us in ſome things, by being *too remote*; in others, by being *too minute*.

When we conſider the vaſt diſtance of the known and viſible parts of the world, and the reaſons we have to think that what lies within our ken is but a ſmall part of the immenſe univerſe, we ſhall then diſcover an huge abyſs of ignorance. What are the particular fabricks of the great maſſes of matter, which make up the whole ſtupendous frame of corporeal beings; how far they are extended; and what is their motion, and how continued; and what influence they have upon one another; are contemplations, that at firſt glimpſe our thoughts loſe themſelves in. If we confine our thoughts to this little ſyſtem of our ſun, and the groſſer maſſes of matter that viſibly move about it; what ſeveral ſorts of vegetables, animals, and intellectual corporeal beings, infinitely different from thoſe of our little ſpot of earth, may probably be in other *planets*, to the knowledge of which, even of their outward figures and parts, we can no way attain, whilſt we are confined to this earth, there being no natural means, either by ſenſation or reflection, to convey their certain *ideas* into our minds?

There are other bodies in the univerſe, no leſs concealed from us by their *minuteneſs*. Theſe inſenſible corpuſcles being the active parts of matter, and the great inſtruments of nature on which depend all their *ſecondary* qualities and operations, our want of preciſe diſtinct *ideas* of their *primary* qualities keeps us in incurable ignorance of what we deſire to know about them. Did we know the mechanical affections of *rhubarb* and *opium*, we might as eaſily account for their operations of *purging* or *cauſing ſleep*, as a watchmaker can for the motions of his watch. The diſſolving of ſilver in *aqua fortis*, or *gold* in *aqua regia*, and not *vice verſa*, would be then, perhaps, no more difficult to know, than it is to a *ſmith* to underſtand why the turning of one key will open a lock, and not the turning of another. But whilſt we are deſtitute of ſenſes acute enough to diſcover the minute particles of bodies, and to give us *ideas* of their mechanical affections, we muſt be content to be ignorant of their properties and operations: Nor can we be aſſured about them any farther than ſome few trials we make are able to reach; but whether they will ſucceed again another time, we cannot be certain. This hinders our certain knowledge of univerſal truths concerning natural bodies; and our reaſon carries us herein very little beyond particular matters of fact. And therefore, how far ſoever human induſtry may advance uſeful and *experimental philoſophy* in phyſical things, yet *ſcientifical* will ſtill be out of our reach; becauſe we want perfect and adequate *ideas* of thoſe very bodies which are neareſt to us, and moſt under our command.

This, at firſt ſight, ſhews us how diſproportionate our knowledge is to the whole extent, even of *material* beings; to which if we add the conſideration of that infinite number of *ſpirits* that may be, and probably are, which are yet more remote from our knowledge, whereof we have no cognizance; we ſhall find this cauſe of ignorance conceal from us, in an impenetrable obſcurity, almoſt the whole *intellectual* world, a greater certainly, and a more beautiful world than the *material*: For bating ſome very few *ideas* of ſpirit we get from our own mind by reflection, and from thence the beſt we can collect of the *Father of all ſpirits*, the Author of them and us and all things, we have no certain information ſo much as of the exiſtence of other ſpirits but by revelation; much leſs have we diſtinct *ideas* of their different natures, ſtates, powers, and ſeveral conſtitutions, wherein they agree or differ one from another, and from us: And therefore in what concerns their different ſpecies and properties, we are under an abſolute ignorance.

The *ſecond* cauſe of ignorance, is the *want of diſcoverable connection* between thoſe *ideas* we have: Where we want that, we are utterly incapable of *univerſal* and *certain* knowledge: and are, as in the former caſe, left only to *obſervation* and *experiment*. Thus the mechanical

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nical affections of bodies having no affinity at all with the *ideas* they produce in us, we can have no diſtinct knowledge of ſuch operations beyond our experience; and can reaſon no otherwiſe about them, than as the effects or appointment of an infinitely *wiſe agent*, which perfectly ſurpaſs our comprehenſions.

The operation of our minds upon our bodies, is as inconceivable. How any *thought* ſhould produce a motion in *body*, is as remote from the nature of our *ideas*, as how any *body* ſhould produce any *thought* in the *mind*. That it is ſo, if experience did not convince us, the conſideration of the things themſelves would never be able in the leaſt to diſcover to us.

In ſome of our *ideas* there are certain relations, habitudes, and connections, ſo viſibly included in the nature of the *ideas* themſelves, that we cannot conceive them ſeparable from them by any power whatſoever: In theſe only we are capable of certain and univerſal knowledge. Thus the *idea* of a *right lined triangle*, neceſſarily carries with it an *equality of its angles to two right ones*. But the coherence and continuity of the parts of matter, the production of ſenſation in us of *colours* and *ſounds*, &c. by impulſe and motion, being ſuch wherein we can diſcover no natural connection with any *ideas* we have, we cannot but aſcribe them to the arbitrary will and good pleaſure of the wiſe Architect.

The things that we obſerve conſtantly to proceed regularly, we may conclude to act by a law ſet them; but yet by a law that we know not; whereby, though cauſes work ſteadily, and effects conſtantly flow from them, yet their connections and dependencies being not diſcoverable in our *ideas*, we can have but an experimental knowledge of them.

The *third* cauſe of ignorance, is our *want of tracing thoſe ideas we have* or may have, and finding out thoſe intermediate *ideas* which may ſhew us what habitude of agreement or diſagreement they may have one with another: And thus many are ignorant of *mathematical* truths, for want of application in inquiring, examining, and by due ways comparing thoſe *ideas*.

Hitherto we have examined the *extent* of our knowledge, in reſpect of the ſeveral ſorts of beings that are: There is another *extent* of it, in reſpect of *univerſality*, which will alſo deſerve to be conſidered; and in this regard our knowledge follows the nature of our *ideas*. If the *ideas* are *abſtract*, whoſe agreement or diſagreement we perceive, our knowledge is *univerſal*. For what is known of ſuch general *ideas*, will be true of every particular thing in which that *eſſence*, that is, *abſtract idea*, is to be found: And what is once known of ſuch *ideas*, will be perpetually, and for ever true. So that, as to all general knowledge, we muſt ſearch and find it only in our own minds: And it is only the examining of our own *ideas* that furniſhes us with that. Truths belonging to eſſences of things, (that is, to *abſtract ideas*), are *eternal*, and are to be found out by the contemplation only of thoſe eſſences, as the exiſtence of things is to be known only from experience.

Of the reality of our knowledge.

The reader by this time may be ready to object, If it be true, that all knowledge lies only in the perception of the agreement or diſagreement of our own *ideas*, the viſions of an *enthuſiaſt*, and the reaſonings of a *ſober* man, will be equally certain: It is no matter how things are, ſo a man obſerve but the agreement of his own imaginations, and talk conformably; it is all truth, all certainty.

To this it is anſwered, that if our knowledge of our *ideas* ſhould terminate in them, and reach no farther, where there is ſomething farther intended, our moſt ſerious thoughts would be of little more uſe than the *reveries* of a crazy brain. But it is evident, that this way of *certainty*, by the knowledge of our own *ideas*, goes a little farther than bare imagination: and that all the certainty of general truths a man has, lies in nothing elſe but this knowledge of our *ideas*.

It is evident, that the mind knows not things immediately, but by the intervention of the *ideas* it has of them. Our knowledge therefore is *real*, only ſo far as there is a conformity between our *ideas* and the reality of things. But how ſhall we know when our *ideas* agree with things themſelves? There are *two ſorts* of *ideas*, that we may be aſſured agree with things: Theſe are,

Firſt, *Simple* ideas; which ſince the mind can by no means make to itſelf, muſt be the effect of things operating upon the mind in a natural way, and producing therein thoſe perceptions, which, by the will of our Maker, they are ordained and adapted to. Hence it follows, that *ſimple ideas* are not fictions of our fancies, but the natural and regular productions of things without us, really operating upon us; which carry with them all the conformity our ſtate requires, which is to repreſent things under thoſe appearances they are fitted to produce in us. Thus the *idea* of *whiteneſs*, as it is in the mind, exactly anſwers that power which is in any body to produce it there. And this conformity between our *ſimple ideas*, and the exiſtence of things, is ſufficient for real knowledge.

Secondly, All our *complex ideas*, except thoſe of ſubſtances, being *archetypes* of the mind's own making, and not referred to the exiſtence of things as to their originals, cannot want any conformity neceſſary to real knowledge: For that which is not deſigned to repreſent any thing but itſelf, can never be capable of a wrong repreſentation. Here the *ideas* themſelves are conſidered as *archetypes*, and things no otherwiſe regarded than as they are conformable to them. Thus the *mathematician* conſiders the truth and properties belonging to a *rectangle*, or *circle*, only as they are *ideas* in his own mind, which poſſibly he never found exiſting mathematically, that is, preciſely true; yet his knowledge is not only certain, but *real*; becauſe real things are no farther concerned, nor intended to be meant by any ſuch propoſitions, than as things really agree to thoſe *archetypes* in his mind. It is true of the *idea* of a *triangle*, *that its three angles are equal to two right ones*: It is true alſo of a *triangle*, wherever it *exiſts*: What is true of thoſe *figures* that have barely an *ideal* exiſtence in his mind, will hold true of them alſo when they come to have a *real* exiſtence in matter.

Hence it follows, that *moral* knowledge is as capable of *real certainty* as *mathematicks*: For *certainty* being nothing

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nothing but the perception of the agreement or disagreement of our *ideas*, and demonstration nothing but the perception of such agreement by the intervention of other *ideas*, our *moral ideas*, as well as *mathematical*, being *archetypes* themselves, and so adequate or complete *ideas*, all the agreement or disagreement we shall find in them will produce *real* knowledge, as well as in *mathematical figures*. That which is requisite to make our knowledge *certain*, is the clearness of our *ideas*; and that which is required to make it *real*, is, that they answer their *archetypes*.

Thirdly, But the complex *ideas*, which we refer to *archetypes* without us, may differ from them, and so our knowledge about them may come short of being real; and such are our *ideas* of *substances*. These must be taken from something that does or has existed, and not be made up of *ideas* arbitrarily put together, without any real pattern. Herein, therefore, is founded the reality of our knowledge concerning *substances*, that all our complex *ideas* of them must be such, and such only, as are made up of such simple ones as have been discovered to coexist in nature. And our *ideas* being thus true, tho' not perhaps very exact copies, are the subjects of the *real* knowledge of them. Whatever *ideas* we have, the agreement we find they have with others will be knowledge. If those *ideas* be abstract, it will be *general* knowledge. But to make it *real* concerning *substances*, the *ideas* must be taken from the real existence of things. Wherever, therefore, we perceive the agreement or disagreement of our *ideas*, there is *certain knowledge*: And wherever we are sure those *ideas* agree with the reality of things, there is *certain real knowledge*.

Of truth in general.

TRUTH, in the proper import of the word, signifies the joining or separating of signs, as the things signified by them do agree or disagree one with another, The joining or separating of signs, is what we call *propositions*; so that *truth* properly belongs only to *propositions*: Whereof there are two sorts, *mental* and *verbal*; as there are *two* sorts of signs commonly made use of, *ideas* and *words*.

It is difficult to treat of *mental* propositions without *verbal*; because, in speaking of *mental*, we must make use of *words*, and then they become *verbal*. Again, men commonly in their thoughts and reasonings use *words* instead of *ideas*; especially if the subject of their meditation contains in it *complex ideas*. If we have occasion to form *mental* propositions about *white, black, circle*, &c. we can, and often do, frame in our minds the *ideas* themselves, without reflecting on the *names*: But when we would consider, or make propositions about the more *complex ideas*, as of a *man, vitriol, fortitude, glory*, &c. we usually put the *name* for the *idea*; because the *idea* these *names* stand for being for the most part confused, imperfect, and undetermined, we reflect on the *names* themselves, as being more clear, certain, and distinct, and readier to occur to our thoughts, than pure *ideas*; and so we make use of these *words* instead of the *ideas* themselves, even when we would meditate and reason within ourselves, and make tacit *mental propositions*.

We must then observe two sorts of *propositions* that we are capable of making: *First, Mental propositions*, wherein the *ideas* in our understandings are put together or separated by the mind perceiving or judging of their agreement or disagreement. *Secondly, Verbal propositions*; which are words put together or separated in affirmative or negative sentences: So that *proposition* consists in joining or separating signs; and *truth* consists in putting together or separating these signs, according as the things they stand for agree or disagree.

Truth, as well as knowledge, may well come under the distinction of *verbal* and *real*; that being only *verbal truth*, wherein terms are joined according to the agreement or disagreement of the *ideas* they stand for, without regarding whether our *ideas* are such as really have or are capable of having an existence in nature. But then it is they contain *real truth*, when these signs are joined as our *ideas* agree: and when our ideas are such as, we know, are capable of having an existence in nature; which in substances we cannot know, but by knowing that such have existed. *Truth* is the marking down in words the agreement or disagreement of *ideas* as it is: *Falsehood* is the marking down in words the agreement or disagreement of *ideas* otherwise than it is; and so for as these *ideas*, thus marked by sounds, agree to their *archetypes*, so far only is the *truth real*. The knowledge of this *truth* consists in knowing what *ideas* the words stand for, and the perception of the agreement or disagreement of those *ideas*, according as it is marked by those words.

Besides *truth* taken in the strict sense before mentioned, there are other sorts of *truths*: As, *first, Moral truth*; which is speaking things according to the persuasion of our own minds. *Secondly, Metaphysical truth*; which is nothing but the real existence of things conformable to the *ideas* to which we have annexed their names.

These considerations of *truth* either having been before taken notice of, or not being much to our present purpose, it may suffice here only to have mentioned them.

Of our knowledge of existence.

HITHERTO we have only considered the *essences* of things; which being only *abstract ideas*, and thereby removed in our thoughts from particular existence, give us no knowledge of *existence* at all. We proceed now to inquire concerning our *knowledge of the existence* of things, and how we come by it.

We have the knowledge of our *own existence* by *intuition*; of *the existence of God*, by *demonstration*; and of *other things*, by *sensation* As for our *own existence*, we perceive it so plainly, that it neither needs, nor is capable of any proof. *I think, I reason, I feel pleasure and pain*: can any of these be more evident to me than my *own existence?* If I doubt of all other things, that very *doubt* makes me perceive my *own existence*, and will not suffer me to doubt of that. If I know I doubt, I have as certain a perception of the *thing* doubting, as of that *thought* which I call *doubt*. Experience then convinces us, that we have an *intuitive knowledge of our own existence*; and an internal infallible perception that we *are*. In every act of sensation, reasoning, or thinking, we are conscious to ourselves of our own being; and

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and in this matter come not ſhort of the higheſt degree of certainty.

Of our knowledge of the exiſtence of a God.

THOUGH *God* has given us no *innate ideas* of himſelf, yet having furniſhed us with thoſe faculties our minds are endowed with, he hath not *left himſelf without a witneſs*, ſince we have ſenſe, perception, and reaſon, and cannot want a clear proof of him as long as we carry ourſelves about us. Nor can we juſtly complain of our ignorance in this great point, ſince he has ſo plentifully provided us with means to diſcover and know him, ſo far as is neceſſary to the end of our being, and the great concernment of our happineſs. But though this be the moſt obvious truth that reaſon diſcovers, yet it requires thought and attention; and the mind muſt apply itſelf to a regular deduction of it, from ſome part of our *intuitive* knowledge; or elſe we ſhall be as ignorant of this, as of other propoſitions which are in themſelves capable of clear demonſtration. To ſhew, therefore, that we are capable of knowing, that is, *being certain*, that *there is a God*, and how we may come by this certainty, we need go no farther that ourſelves, and that undoubted knowledge we have of our own *exiſtence*. It is beyond queſtion, that *man has a clear perception of his own being:* He knows certainly that he exiſts, and that he is ſomething. In the next place, man knows by an *intuitive* certainty, that *bare nothing can no more produce any real being, than it can be equal to two right angles.* If therefore, we know there is ſome real being, it is an evident demonſtration, that *from eternity there has been ſomething*; ſince what was not from eternity had a beginning; and what had a beginning, muſt be produced by ſomething elſe. Next, it is evident, that *what has its being from another, muſt alſo have all that which is in and belongs to its being from another too:* All the powers it has, muſt be owing to, and received from the ſame ſource. This eternal ſource then of all being muſt be alſo the ſource and original of all power; and ſo this *eternal Being* muſt be alſo the *moſt powerful*.

Again, man finds in himſelf *perception* and *knowledge:* We are certain, then, that there is not only ſome being, but ſome knowing intelligent being in the world. There was a time, then, when there was no knowing being, or elſe there has been a knowing being from eternity. If it be ſaid, there was a time when that eternal being had no knowledge; the reply is, that then it is impoſſible there ſhould have ever been any knowledge; it being as impoſſible that things wholly void of knowledge, and operating blindly, and without any perception, ſhould produce a knowing being, as it is that a triangle ſhould make itſelf three angles bigger than two right ones.

Thus from the conſideration of ourſelves, and what we infallibly find in our own conſtitutions, our reaſon leads us to the knowledge of this certain and evident truth, that *there is an eternal, moſt powerful, and knowing being*; and from this *idea* duly conſidered, will eaſily be deduced all thoſe other *attributes* we ought to aſcribe to this *eternal being*.

From what has been ſaid, it is plain, we have a more certain knowledge of the exiſtence of a *God*, than of any thing our ſenſes have not immediately diſcovered to us; nay, that we more certainly know that there is a *God*, than that there is any thing elſe without us.

It being then unavoidable for all rational creatures to conclude, that *ſomething has exiſted from eternity:* let us next ſee what *kind of thing* that muſt be. There are but two two ſorts of beings in the world, that man knows or conceives. *Firſt*, Such as are purely material, without ſenſe or perception, as the clippings of our beards, and parings of our nails. *Secondly*, Senſible perceiving beings; ſuch as we find ourſelves to be. Theſe two ſorts we ſhall hereafter call *cogitative* and *incogitative* beings: Which to our preſent purpoſe are better than *material* and *immaterial*.

If then there muſt be ſomething *eternal*, it is very obvious to reaſon, that it muſt neceſſarily be a *cogitative* being; becauſe it is as impoſſible to conceive that ever bare *incogitative* matter ſhould produce a *thinking* intelligent being, as that nothing ſhould of itſelf produce matter. Let us ſuppoſe any parcel of matter *eternal*, we ſhall find it in itſelf unable to produce any thing. Let us ſuppoſe its parts firmly at reſt together: If there were no other being in the world, muſt it not eternally remain ſo, a dead unactive lump? Is it poſſible to conceive it can add motion to itſelf, or produce any thing? *Matter* then by its own ſtrength cannot produce in itſelf ſo much as *motion*. The motion it has muſt alſo be from eternity, or elſe added to matter by ſome other being more powerful than matter. But let us ſuppoſe motion eternal too; yet matter, *incogitative* matter and motion, could never produce *thought: Knowledge* will ſtill be as far beyond the *power* of *motion* and *matter* to produce, as matter is beyond the power of nothing to produce. Divide *matter* into as minute parts as you will, vary the figure and motion of it as much as you pleaſe, it will operate no otherwiſe upon other bodies of proportionable bulk, than it did before this diviſion. The minuteſt particles of matter knock, impel, and reſiſt one another, juſt as the greater do; and that is all they can do. So that if we will ſuppoſe *nothing eternal, matter can never begin to be:* If we ſuppoſe *bare matter* without motion *eternal, motion can never begin to be:* If we ſuppoſe only matter and motion eternal, *thought can never begin to be*: For it is impoſſible to conceive that matter, either with or without motion, could have originally, in and from itſelf ſenſe, perception, and knowledge; as is evident from hence, that then ſenſe, perception and knowledge, muſt be a property eternally inſeparable from matter and every particle of it. Since therefore whatſoever is the firſt eternal being, muſt neceſſarily be *cogitative*; and whatſoever is firſt of all things, muſt neceſſarily contain in it, and actually have, at leaſt all the perfections that can ever after exiſt, it neceſſarily follows, that the *firſt eternal being cannot be matter*.

If therefore it be evident that ſomething neceſſarily muſt exiſt from eternity, it is alſo evident, that that *ſomething muſt neceſſarily be a cogitative being:* For it is as impoſſible that *incogitative matter* ſhould produce a *cogitative being*, as that nothing, or the negation of all being, ſhould produce a poſitive being or matter.

This diſcovery of the neceſſary exiſtence of an Eternal Mind,

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mind does sufficiently lead us into the knowledge of *God*. For it will hence follow, that all other knowing beings that have a beginning must depend on him, and have no other ways of knowledge or extent of power than what he gives them; and therefore if he made those, he made also the less excellent pieces of this universe, all *inanimate bodies*, whereby his *omniscience*, *power*, and *providence*, will be established; and from thence all his other attributes necessarily follow.

Of our knowledge of the existence of other things.

The knowledge of our own being we have by *intuition:* The existence of a *God*, *reason* clearly makes known to us. The *knowledge of the existence* of any other thing, we can have only by *sensation*; for there being no necessary connection *of real existence* with any *idea* a man hath in his memory; nor of any other existence, but that of *God*, with the existence of any particular man; no particular man can know the existence of any other being, but only when, by actually operating upon him, it makes itself be perceived by him. The having the *idea* of any thing in our mind, no more proves the existence of that thing, than the picture of a man evidences his being in the world, or the visions of a dream make thereby a true history. It is therefore the actual receiving of *ideas* from without, that gives us notice of the existence of other things, and makes us know that something doth exist at that time without us, which causes that *idea* in us, though perhaps we neither know nor consider how it does it; for it takes not from the *certainty* of our senses, and the *ideas* we receive by them, that we know not the manner wherein they are produced. This *notice* we have by our *senses* of the existing of things without us, though it be not altogether so certain as *intuition* and *demonstration*, deserves the name of knowledge, if we persuade ourselves that our faculties act and inform us right concerning the existence of those objects that affect them. But besides the assurance we have from our *senses* themselves, that they do not err in the information they give us of the existence of things without us, we have other concurrent reasons: As, *First*, It is plain those perceptions are produced in us by exterior causes affecting our senses, because those that want the *organs* of any *sense* never can have the *ideas* belonging to that sense produced in their minds. This is too evident to be doubted; and therefore we cannot but be assured, that they come in by the organs of that sense, and no other way.

Secondly, Because we find sometimes that we cannot avoid the having those *ideas* produced in our minds. When my eyes are shut, I can at pleasure recall to my mind the *ideas* of *light*, or the *sun*, which former sensations had lodged in my memory: But if I turn my eyes towards the *sun*, I cannot avoid the *ideas* which the *light* or the *sun* then produces in me Which shews a manifest difference between those *ideas* laid up in the memory, and such as force themselves upon us, and we cannot avoid having. And therefore it must needs be some *exterior* cause, whose efficacy I cannot resist, that produces those *ideas* in my mind whether I will or no.

Besides, there is nobody who doth not perceive the difference in himself, between actually looking upon the *sun*, and contemplating the *idea* he has of it in his memory; and therefore he hath certain knowledge, that they are not both memory or fancy, but that actual seeing has a cause without.

Thirdly, Add to this, that many *ideas* are produced in us with pain, which we afterwards remember without the least offence. Thus the pain of *heat* or *cold*, when the *idea* of it is received in our minds, gives us no disturbance, which, when felt, was very troublesome; and we remember the pain of *hunger*, *thirst*, *head-ach*, &c. without any pain at all, which would either never disturb us, or else constantly do it, as often as we thought of it, were there nothing more but *ideas* floating in our minds, and appearances entertaining our fancies, without the real existence of things affecting us from abroad.

Fourthly, Our *senses* in many cases bear witness to the truth of each other's report concerning the existence of sensible things without us: he that doubts when he sees a *fire*, whether it be *real*, may, if he please, feel it too; and by the exquisite pain he will be convinced, that it is not a bare *idea* or *phantom*.

If after all this, any one will be so *sceptical*, as to distrust his senses, and to question the existence of all things, or our knowledge of any thing, let him consider that the certainty of things existing *in rerum natura*, when we have the testimony of our senses for it, is not only as great as our frame can attain to, but as our condition needs. For our *faculties* being not suited to the full extent of being, nor a clear comprehensive knowledge of all things, but to the preservation of us in whom they are, and accommodated to the use of life; they serve our purpose well enough, if they will but give us certain notice of those things that are convenient or inconvenient to us: For he that sees a *candle* burning, and has experimented the force of the flame, by putting his finger in it, will little doubt that this is something existing without him which does him harm, and puts him to pain; which is assurance enough; when no man requires greater certainty to govern his actions by, than what is as certain as his actions themselves: So that this evidence is as great as we can desire, being as certain to us as our pleasure or pain, that is, *happiness* or *misery*; beyond which we have no concernment either of knowing or being.

In fine, when our *senses* doth actually convey into our understandings any *idea*, we are assured that there is something at that time *really existing* without us. But this knowledge extends only as far as the present testimony of our senses, employed about particular objects, that do then affect them, and no farther. My seeing a *man* a minute since, is no certain argument of his present existence.

As when our *senses* are actually employed about any object, we know that it does exist; so by our memory we may be assured, that heretofore things that affected our *senses have existed:* And thus we have the knowledge of the past existence of several things whereof our senses having informed us, our memories still retain the *ideas*; and of this we are past all doubt, so long as we remember well.

As to the *existence* of *spirits*, our having *ideas* of them does not make us know that any such things do exist without

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without us, or that there are any *finite ſpirits*, or any other *ſpiritual beings* but the *eternal God*. We have ground from *revelation*, and ſeveral other reaſons, to believe with aſſurance, that there are ſuch creatures: But our ſenſes not being able to diſcover them, we want the means of knowing their particular exiſtence; for we can no more know that there are *finite ſpirits* really exiſting, by the *ideas* we have of ſuch beings, than by the *ideas* any one has of *fairies*, or *centaurs*, he can come to know, that things anſwering thoſe *ideas* do really exiſt.

Hence we may gather, that there are *two ſorts* of propoſitions: *One* concerning the exiſtence of any thing anſwerable to ſuch an *idea*, as that of an *elephant*, *phœnix*, *motion*, or *angel*, *viz.* whether ſuch a thing does any where exiſt: And this knowledge is only of *particulars*, and not to be had of any thing without us, but only of *God*, any other way than by our *ſenſes*.

Another ſort of propoſition is, wherein is expreſſed the agreement or diſagreement of our *abſtract ideas*, and their dependance one on another. And theſe may be *univerſal* and certain: ſo having the *idea* of *God* and my *ſelf*, of *fear* and *obedience*, I cannot but be ſure that *God is to be feared and obeyed by me:* and this propoſition will be certain concerning *man* in general, if I have made an *abſtract idea* of ſuch a *ſpecies*, whereof I am one particular. But ſuch a propoſition, how certain ſoever, proves not to me the exiſtence of men in the world; but will be true of all ſuch creatures, whenever they do exiſt: which *certainty* of ſuch general propoſitions, depends on the agreement or diſagreement diſcoverable in thoſe *abſtract ideas*. In the former caſe, our knowledge is the conſequence of the *exiſtence of things* producing *ideas* in our minds by our ſenſes: in the latter, the conſequences of the *ideas* that *are in our minds*, and producing theſe general propoſitions, many whereof are called *eternæ veritates:* and all of them indeed are ſo; not from being written all or any of them in the minds of all men, or that they were any of them propoſitions in any one's mind, till he, having got the *abſtract ideas*, joined or ſeparated them by affirmation or negation; but whereſoever we can ſuppoſe ſuch a creature as *man* is, endowed with ſuch faculties, and thereby furniſhed with ſuch *ideas* as we have, we muſt conclude he muſt needs, when he applies his thoughts to the conſideration of his *ideas*, know the truth of certain propoſitions that will ariſe from the agreement or diſagreement he will perceive in his own *ideas*. Such propoſitions being once made about *abſtract ideas*, ſo as to be true, they will, whenever they can be ſuppoſed to be made again, at any time paſt, or to come, by a mind having thoſe *ideas*, always be true: for names being ſuppoſed to ſtand perpetually for the ſame *ideas*, and the ſame *ideas* having immutably the ſame habitudes one to another, propoſitions concerning any *abſtract ideas* that are once true muſt needs be *eternal verities*.

Of judgment.

THE *underſtanding faculties* being given to man, not barely for ſpeculation, but alſo for the conduct of his life, a man would be at a great loſs, if he had nothing to direct him but what has the certainty of true knowledge. He that will not *eat* till he has demonſtration that it will nouriſh him, nor *ſtir* till he is infallibly aſſured of ſucceſs in his buſineſs, will have little elſe to do but *ſit ſtill, and periſh*.

Therefore as *God* hath ſet ſome things in broad *daylight;* as he has given us ſome certain knowledge, though limited to a few things, in compariſon, (probably as a taſte of what *intellectual* creatures are capable of, to excite in us a deſire and endeavour after a better ſtate;) ſo in the greateſt part of our concernment, he has afforded us only the *twilight* of *probability*, ſuitable to that ſtate of *mediocrity* and *probationerſhip* he has been pleaſed to place us in here.

The faculty which *God* has given *man* to enlighten him, next to certain knowledge, is *judgment;* whereby the mind takes its *ideas* to agree or diſagree, without perceiving a demonſtrative evidence in the proofs. The mind exerciſes this judgment ſometimes out of *neceſſity*, where demonſtrative proofs and certain knowledge are not to be had; and ſometimes out of *lazineſs*, unſkilfulneſs, or haſte, even where they are to be had.

This faculty of the mind, when it is exerciſed immediately about things, is called *judgment*; when about truths delivered in words, is moſt commonly called *aſſent* or *diſſent*. Thus the mind has *two faculties* converſant about truth and falſehood: Firſt, *Knowledge*; whereby it certainly perceives, and is undoubtedly ſatisfied of the agreement or diſagreement of any ideas. Secondly, *Judgment*, which is the putting *ideas* together, or ſeparating them from one another in the mind, when their certain agreement or diſagreement is not *perceived*, but preſumed to be be ſo. And if it ſo unites or ſeparates them as in reality things are, it is *right judgment*.

Of probability.

PROBABILITY is nothing but the appearance of the agreement or diſagreement of two *ideas*, by the intervention of proofs, whoſe connection is not conſtant and immutable, or is not perceived to be ſo; but is or appears for the moſt part to be ſo; and is enough to induce the mind to judge the propoſition to be *true* or *falſe*, rather than the contrary.

Of *probability* there are degrees, from the neighbourhood of *certainty* and *demonſtration*, quite down to *improbability* and *unlikelineſs*, even to the confines of *impoſſibility:* And alſo degrees of *aſſent* from certain knowledge, and what is next it, full aſſurance and confidence, quite down to conjecture, doubt, diſtruſt, and diſbelief.

That propoſition then is *probable*, for which there are arguments or proofs to make it paſs or be received for *true:* The entertainment the mind gives to this ſort of propoſitions, is called *belief*, *aſſent*, or *opinion*. *Probability* then being to ſupply the defect of our knowledge, is always converſant about propoſitions whereof we have no *certainty*, but only ſome *inducements* to receive them for true. The *grounds* of it are, in ſhort, *theſe two* following.

Firſt, The *conformity* of any thing with our own knowledge, experience, or obſervation.

Secondly, The *teſtimony* of others, vouching their obſervation and experience. In the *teſtimony* of others is

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to be conſidered, *Firſt*, The number; *Secondly*, The integrity; *Thirdly*, The ſkill of the witneſſes; *Fourthly*, The deſign of the author, if it be a teſtimony cited out of a book; *Fifthly*, The conſiſtency of the parts and circumſtances of the relation; *Sixthly*, Contrary teſtimonies.

The mind, before it rationally *aſſents* or *diſſents* to any probable propoſition, ought to examine all the grounds of *probability*, and ſee how they make, more or leſs, for or againſt it; and upon a due balancing of the whole, reject or receive it, with a more or leſs firm *aſſent*, according to the preponderancy of the greater *grounds* of *probability* on one ſide, or the other.

Of the degrees of aſſent.

THE *grounds of probability*, laid down in the foregoing ſection, as they are the foundations on which our *aſſent* is built, ſo are they alſo the meaſure whereby its ſeveral *degrees* are (or ought to be) regulated. Only we are to take notice, that no grounds of probability operate any farther on the mind, which ſearches after truth, and endeavours to judge right, than they appear, at leaſt, in the firſt judgment or ſearch that the mind makes. It is indeed in many caſes impoſſible, and in moſt very hard, even for thoſe who have admirable memories, to retain all the proofs which, upon a due examination, made them embrace that ſide of the queſtion. It ſuffices, that they have once, with care and fairneſs, ſifted the matter as far as they could; and having once found on which ſide the *probability* appeared to them, they lay up the concluſion in their memories, as a *truth* they have diſcovered; and for the future remain ſatisfied with the teſtimony of their memories, that this is the opinion, that, by the proofs they have once ſeen of it, deſerves ſuch a *degree* of their *aſſent* as they afford it.

It is unavoidable then that the memory be relied on in this caſe, and that men be perſuaded of ſeveral *opinions*, whereof the proofs are not actually in their thoughts, nay, which perhaps they are not able actually to recall: Without this the greateſt part of men muſt be either *ſceptics*, or change every moment, when any one offers them arguments which for want of memory, they are not preſently able to anſwer.

It muſt be owned, that mens ſticking to paſt judgments, is often the cauſe of great *obſtinacy* in error and miſtake: But the fault is not that they rely on their memories for what they have before well judged, but becauſe they judged before they had well examined. Who almoſt is there that hath the leiſure, patience, and means, to collect together all the proofs concerning moſt of the opinions he has, ſo as ſafely to conclude, that he has a clear and full view, and that there is no more to be alledged for his better information? And yet we are forced to determine ourſelves on one ſide, or other: The conduct of our lives, and the management of our great concerns, will not bear delay: For thoſe depend, for the moſt part, on the determination of our judgment in points, wherein we are not capable of certain knowledge, and wherein it is neceſſary for us to embrace one ſide or the other.

The propoſitions we receive upon inducements of *probability*, are of *two ſorts*: *Firſt*, Concerning ſome particular exiſtence, or matter of *fact*, which falling under our obſervation, is capable of *human teſtimony*: *Secondly*, Concerning things which, being beyond the diſcovery of our *ſenſes*, are not capable of human teſtimony..

Concerning the firſt of theſe, *viz. Particular matter of fact.*

Firſt, Where any particular thing, conſonant to the conſtant obſervation of ourſelves, and others, in the like caſe, comes atteſted with the concurrent reports of all that mention it, we receive it as eaſily, and build as firmly upon it, as if it were certain knowledge. Thus, if all *Engliſhmen*, who have occaſion to mention it, ſhould report, that it *froze* in *England* laſt winter, or the like, a man would as little doubt of it, as that *ſeven and four are eleven*.

The *firſt* and *higheſt* degree of *probability* then is, when the general conſent of all men, in all ages, as far as can be known, concurs with a man's own conſtant experience in the like caſes, to confirm the truth of any particular matter of fact, atteſted by fair witneſſes: Such are the ſtated *conſtitutions* and *properties* of bodies, and the regular proceedings of *cauſes* and *effects* in the ordinary courſe of *nature*. This we call an *argument* from the nature of things themſelves: For what we and others always obſerve to be after the ſame manner, we conclude with reaſon to be the effects of ſteady and regular *cauſes*, though they come not within the reach of our knowledge; as that fire warmed a man, or made *lead fluid*; that *iron* ſunk in water, ſwam in quickſilver. A relation affirming any ſuch thing to have been, or a predication that it will happen again in the ſame manner, is received without doubt or heſitation; and our *belief* thus grounded, riſes to *aſſurance*.

Secondly, The next degree of *probability*, is when by my own experience, and the agreement of all others that mention it, a *thing* is found to be for the moſt part ſo; and that the particular inſtance of it is atteſted by many and undoubted *witneſſes*. Thus *hiſtory* giving us ſuch an account of men in all ages, and my own experience confirming it, that moſt men prefer their own private advantage to the public; if all hiſtorians that write of *Tiberius*, ſay that he did ſo, it is extremely probable: And in this caſe, our *aſſent* riſes to a degree which we may call *confidence*.

Thirdly, In matters happening indifferently, as that a *bird* ſhould fly this or that way; when any particular matter of fact comes atteſted by the concurrent teſtimony of unſuſpected *witneſſes*, there our *aſſent* is alſo unavoidable. Thus, that there is in *Italy* ſuch a city as *Rome*; that about one thouſand and ſeven hundred years ago there lived ſuch a man in it as *Julius Cæſar*, &c a man can as little doubt of this, and the like, as he does of the being and actions of his own acquaintance, whereof he himſelf is a witneſs.

Probability, on theſe grounds, carries ſo much evidence with it, that it leaves us as little liberty to believe or diſbelieve, as demonſtration does, whether we will know or be ignorant. But the difficulty is, when teſtimonies contradict common experience, and the reports of witneſſes claſh with the ordinary courſe of nature, or with one another; here diligence, attention, and exactneſs, is required

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quired to form a *right judgment*, and to proportion the *aſſent* to the evidence and *probability* of the thing, which riſes and falls according as the two foundations of credibility favour or contradict it. Theſe are liable to ſuch variety of contrary obſervations, circumſtances, reports, tempers, deſigns, over-ſight, &c. of reporters, that it is impoſſible to reduce to preciſe rules the various degrees wherein men give their *aſſent*. This in general may be ſaid, that as the *proofs*, upon due examination, ſhall to any one appear in a greater or leſs degree to preponderate on either ſide, ſo they are fitted to produce in the mind ſuch different entertainments, as are called *belief*, *conjecture*, *gueſs*, *doubt*, *wavering*, *diſtruſt*, *diſbelief*, &c.

It is a *rule* generally approved, that any teſtimony, the farther off it is removed from the original truth, the leſs force it has: And in *traditional* truths, each remove weakens the force of the *proof*. There is a *rule* quite contrary to this, advanced by ſome men, who look on *opinions* to gain force by growing *older*. Upon this ground, propoſitions evidently falſe or doubtful in their firſt beginning, come by an inverted *rule* of *probability* to paſs for *authentic* truths; and thoſe which deſerved little credit from the mouths of their firſt relators, are thought to grow *venerable* by age, and are urged as undeniable.

But certain it is, that no *probability can riſe above its firſt original*. What has no other evidence than the ſingle teſtimony of *one witneſs*, muſt ſtand or fall by his *only* teſtimony, though afterwards cited by hundreds of others; and is ſo far from receiving any ſtrength thereby, that it becomes the weaker; becauſe paſſion, intereſt, inadvertency, miſtake of his meaning, and a thouſand odd reaſons, which capricious mens minds are acted by, may make one man quote another's words or meaning wrong. This is certain, that what in one age was affirmed upon ſlight grounds, can never after come to be more valid in future ages by being often repeated.

The ſecond ſort of probability, is concerning things not falling under the reach of our ſenſes, and therefore not capable of teſtimony: And ſuch are,

1*ſt*, The exiſtence, nature, and operations of *finite immaterial* beings without us, as *ſpirits*, *angels*, &c. or the exiſtence of *material* beings, ſuch as, for their ſmallneſs or remoteneſs, our *ſenſes* cannot take notice of; as whether there be any *plants*, *animals*, &c. in the *planets*, and other manſions of the vaſt univerſe.

2*dly*, Concerning the manner of operation in moſt parts of the works of *nature*; wherein though we ſee the ſenſible *effects*, yet their cauſes are unknown, and we perceive not the ways and manner how they are produced. We ſee *animals* are generated, nouriſhed, and move; the *loadſtone* draws *iron*, &c. But the cauſes that operate, and the manner they are produced in, we can only gueſs, and probably conjecture. In theſe matters *analogy* is the only help we have; and it is from that alone we draw all our grounds of *probability*. Thus obſerving, that the bare rubbing of two bodies violently upon one another, produces *heat*, and very often *fire*, we have reaſon to think, that what we call *heat* and *fire* conſiſts in a certain violent agitation of the imperceptible minute parts of the burning matter. This ſort of *probability*, which is the beſt conduct of rational experiments, and the riſe of *hypotheſes*, has alſo its uſe and influence. And a wary reaſoning from *analogy* leads us often into the diſcovery of *truths* and uſeful *deductions*, which would otherwiſe lie concealed.

Though the common experience, and the ordinary courſe of things, have a mighty influence on the minds of men, to make them give or refuſe credit to any thing propoſed to their belief; yet there is one caſe wherein the ſtrangeneſs of the fact leſſens not the *aſſent* to a fair teſtimony given of it. For where ſuch ſupernatural *events* are ſuitable to ends aimed at by Him who has the power to change the courſe of nature, there, under ſuch circumſtances, they may be the fitter to procure belief, by how much the more they are beyond or contrary to ordinary obſervation. This is the proper caſe of *miracles*; which, well atteſted, do not only find credit themſelves, but give it alſo to other *truths*.

There are propoſitions that challenge the higheſt degree of our *aſſent* upon bare teſtimony, whether the thing propoſed agree or diſagree with common experience and the ordinary courſe of things or no: The reaſon whereof is, becauſe the teſtimony is of ſuch *an one* as cannot deceive nor be deceived; and that is *God* himſelf. This carries with it certainty beyond doubt, evidence beyond exception. This is called by a peculiar name, *revelation*, and our *aſſent* to it, *faith*, which has as much certainty in it as our knowledge itſelf; and we may as well doubt of our own *being*, as we can whether any *revelation* from *God* be *true*. So that *faith* is a ſettled and ſure principle of *aſſent* and *aſſurance*, and leaves no manner of room for doubt or heſitation; only we muſt be ſure, that it be a divine *revelation*, and that we underſtand it right, elſe we ſhall expoſe ourſelves to all the extravagancy of *enthuſiaſm*, and all the error of wrong principles, if we have *faith* and *aſſurance* in what is not *divine revelation*.

Of reaſon.

The word *reaſon*, in *Engliſh*, has different ſignifications. Sometimes it is taken for *true* and *clear principles*; ſometimes for *clear* and *fair deductions* from thoſe principles; ſometimes for the *cauſe*, and particularly for the *final cauſe*: But the conſideration we ſhall have of it here, is as it ſtands for a *faculty* whereby *man* is ſuppoſed to be diſtinguiſhed from *beaſts*, and wherein it is evident he much ſurpaſſes them.

Reaſon is neceſſary, both for the enlargement of our knowledge, and regulating our aſſent; for it hath to do both in knowledge and opinion, and is neceſſary and aſſiſting to all our other intellectual faculties; and indeed contains *two* of them, *viz.* firſt, *Sagacity*, whereby it finds intermediate *ideas*; ſecondly, *Illation*, whereby it ſo orders and diſpoſes of them, as to diſcover what connection there is in each link of the chain, whereby the extremes are held together, and thereby, as it were, to draw into view the truth ſought for; which is that we call *illation*, or *inference*, and conſiſts in nothing but the perception of the connection there is between the *ideas* in each ſtep of the deduction; whereby the mind comes to ſee either the certain agreement or diſagreement of any

two *ideas*, as in *demonſtration*, in which it arrives at knowledge; or their probable connection, on which it gives or with-holds its *aſſent*, as in *opinion*.

Senſe and *intuition* reach but a little way: The greateſt part of our knowledge depends upon deductions and intermediate *ideas*. In thoſe caſes where we muſt take propoſitions for true, without being certain of their being ſo, we have need to find out, examine, and compare the grounds of their *probability*: In both caſes, the faculty which finds out the means, and rightly applies them to diſcover certainty in the one, and probability in the other, is that which we call *reaſon*: So that in reaſon we may conſider theſe *four* degrees; *firſt*, The diſcovering and finding out of proofs; *ſecondly*, The regular and methodical diſpoſition of them, and laying them in ſuch order as their connection may be plainly perceived; *thirdly*, The perceiving their connection; *fourthly*, The making a right concluſion.

There is one thing more which deſerves to be conſidered concerning *reaſon*; and that is, whether *ſyllogiſm*, as is generally thought, be the proper inſtrument of it; and the uſefulleſt way of exerciſing this faculty. The cauſes to doubt of it, are theſe:

Firſt, Becauſe *ſyllogiſm* ſerves our *reaſon* but in one only of the forementioned parts of it; and that is, to ſhew the connection of the proofs of any one inſtance, and no more: But in this it is of no great uſe, ſince the mind can perceive ſuch connection, where it really is, as eaſily, nay perhaps better, without it. We may obſerve, that there are many men that reaſon exceeding clear and rightly, who know not how to make a *ſyllogiſm*: And ſcarce any one make *ſyllogiſms* in reaſoning within himſelf. Indeed, ſometimes they may ſerve to diſcover a fallacy, hid in a *rhetorical* flouriſh; or by ſtripping an abſurdity of the cover of wit and good language, ſhew it in its naked deformity: But the weakneſs or fallacy of ſuch a looſe diſcourſe it ſhews, by the artificial form it is put into, only to thoſe who have throughly ſtudied *mode* and *figure*, and have ſo examined the many ways that three propoſitions may be put together, as to know which of them does certainly conclude right, and which not, and upon what grounds it is that they do ſo: But they who have not ſo far looked into thoſe forms, are not ſure, by virtue of *ſyllogiſm*, that the concluſion certainly follows from the premiſſes; the mind is not taught to reaſon by theſe *rules*; it has a native faculty to perceive the coherence or incoherence of its *ideas*, and can range them right without any ſuch perplexing *repetitions*.

And to ſhew the weakneſs of an argument, there needs no more but to ſtrip it of the ſuperfluous *ideas*, which, blended and confounded with thoſe on which the inference depends, ſeem to ſhew a connection where there is none, or at leaſt do hinder the diſcovery of the want of it; and then to lay the naked *ideas*, on which the force of the argumentation depends, in their due order; in which poſition the mind, taking a view of them, ſees what connection they have, and ſo is able to judge of the inference without any need of ſyllogiſm at all.

Secondly, Becauſe ſyllogiſms are not leſs liable to fallacies than the plainer ways of argumentation. And for this we appeal to common obſervation, which has always found theſe artificial methods of reaſoning more adapted to catch and entangle the mind, than to inſtruct and inform the underſtanding. And if it be certain that fallacy can be couched in ſyllogiſms, as it cannot be denied, it muſt be ſomething elſe, and not ſyllogiſm, that muſt diſcover them: But if men ſkilled in and uſed to ſyllogiſms, find them aſſiſting to their reaſon in the diſcovery of truth, we think they ought to make uſe of them. All that we aim at is, that they ſhould not aſcribe more to theſe forms than belongs to them; and think that men have no uſe, or not ſo full a uſe, of their reaſoning faculty without them.

But however it be in knowledge, it is of far leſs, or no uſe at all in *probabilities*: For the *aſſent* there being to be determined by the preponderancy, after a due weighing of all the proofs on both ſides, nothing is ſo unfit to aſſiſt the mind in that as *ſyllogiſm*; which running away with one aſſumed *probability*, purſues that till it has led the mind quite out of ſight of the thing under conſideration.

But let it help us (as perhaps may be ſaid) *in convincing men of their errors or miſtakes*: yet ſtill it fails our reaſon in that part, which if not its higheſt perfection, is yet certainly its hardeſt taſk, and that which we moſt need its help in; and that is, *the finding out of proofs, and making new diſcoveries*. This way of reaſoning diſcovers no new proofs, but is the art of marſhalling and ranging the old ones we have already. A man knows firſt, and then he is able to prove *ſyllogiſtically*; ſo that *ſyllogiſm* comes after knowledge; and then a man has little or no need of it. But it is chiefly by the finding out thoſe *ideas* that ſhew the connection of diſtant ones, that our ſtock of knowledge is increaſed, and that uſeful arts and ſciences are advanced.

Reaſon, though of a very large extent, fails us in ſeveral inſtances; as, *firſt*, Where our *ideas* fail. *Secondly*, It is often at a loſs, becauſe of the obſcurity, confuſion, nor imperfection of the *ideas* it is employed about. Thus having no perfect *idea* of the leaſt extenſion of *matter*, or of *infinity*, we are at a loſs about the diviſibility of *matter*. *Thirdly*, Our *reaſon* is often at a ſtand, becauſe it perceives not thoſe *ideas*, which would ſerve to ſhew the certain or probable agreement or diſagreement of any two other *ideas*. *Fourthly*, Our *reaſon* is often engaged in abſurdities and difficulties, by proceeding upon falſe principles, which being followed, lead men into contradictions to themſelves, and inconſiſtency in their own thoughts. *Fifthly*, Dubious words, and uncertain ſigns, often puzzle mens *reaſon*, and bring them to a nonplus.

Though the deducing one propoſition from another, be a great part of reaſon, and that which it is uſually employed about; yet the principal act of ratiocination, is the finding the agreement or diſagreement of two *ideas* one with another, by the intervention of a third; as a man, by a yard, finds two houſes to be of the ſame length, which could not be brought together to meaſure their equality by *juxta-poſition*: Words have their conſequences as the ſigns of ſuch *ideas*: and things agree or diſagree, as really they are; but we obſerve it only by our *ideas*.

In

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In reaſoning, men ordinarily uſe *four* ſorts of *arguments*.

The *firſt* is to alledge the opinions of men, whoſe parts, learning, eminency, power, or ſome other cauſe, has gained a name, and ſettled their reputation in the common eſteem with ſome kind of authority: This may be called *argumentum ad verecundiam*.

Secondly, Another way is, to require the adverſary to admit what they alledge as a proof, or to aſſign a better: This is called *argumentum ad ignorantiam*.

A *third* way, is to preſs a man with conſequences drawn from his own priciples or conceſſions: This is known under the name of *argumentum ad hominem*.

Fourthly, The uſing of proofs drawn from any of the foundations of knowledge or probability: This is called *argumentum ad judicium*. This alone, of all the four, brings true inſtruction with it, and advances us in our way to knowledge: For, *firſt*, It argues not another man's opinion to be right, becauſe I out of reſpect, or any other conſideration but that of conviction, will not contradict him. *Secondly*, It proves not another man to be in the right way, nor that I ought to take the ſame with him, becauſe I know not a better. *Thirdly*, Nor does it follow, that another man is in the right way, becauſe he has ſhewn me that I am in the wrong: This may diſpoſe me, perhaps, for the reception of truth, but helps me not to it; that muſt come from *proofs and arguments*, and light ariſing from the nature of things themſelves; not from my ſhame-facedneſs, ignorance, or error.

By what has been ſaid of *reaſon*, we may be able to make ſome gueſs at the diſtinction of things into thoſe that are according to, above, and contrary to *reaſon*. *According to reaſon*, are ſuch propoſitions whoſe truth we can diſcover by examining and tracing thoſe *ideas* we have from *ſenſation* and *reflection*, and by natural deduction find to be true or probable. *Above reaſon*, are ſuch propoſitions, whoſe *truth* or *probability* we cannot by *reaſon* derive from thoſe principles. *Contrary to reaſon*, are ſuch propoſitions as are inconſiſtent with, or irreconcileable to our clear and diſtinct *ideas*. Thus the *exiſtence of one God*, is according to *reaſon*; the *exiſtence of more than one God*, contrary to *reaſon*; the *reſurrection of the body* after death, above *reaſon*. *Above reaſon*, may be alſo taken in a double ſenſe, *viz.* *Above probability*, or, *above certainty*: In that large ſenſe alſo, *contrary to reaſon* is ſometimes taken.

There is another uſe of the word *reaſon*, wherein it is oppoſed to *faith*; which, though authoriſed by common uſe, yet is it in itſelf a very improper way of ſpeaking; for *faith* is nothing but a firm *aſſent* of the mind; which, if it be regulated as is our duty, cannot be afforded to any thing but upon good *reaſon*, and ſo cannot be oppoſite to it: He that believes without having any reaſon for believing, may be in love with his own fancies; but neither ſeeks *truth* as he ought, nor pays the obedience due to his Maker, who would have him uſe thoſe diſcerning faculties he has given him, to keep him out of miſtake and error.

MET

METAPLASMUS, in grammar, a tranſmutation or change made in a word, by adding, retrenching, or altering a letter or ſyllable thereof.

METASTASIS, in medicine, a tranſpoſition or ſettlement of ſome humour or diſeaſe on ſome other part; and ſometimes it ſignifies ſuch an alteration of a diſeaſe as is ſucceeded by a ſolution.

METATARSUS, in anatomy. See ANATOMY, p. 187.

METATHESIS, in grammar, a ſpecies of the metaplaſmus; being a figure whereby the letters or ſyllables of a word are tranſpoſed, or ſhifted out of their uſual ſituation, as piſtris for priſtis.

METEMPSYCHOSIS, the doctrine of tranſmigration, which ſuppoſes that human ſouls, upon leaving the body, become the ſouls of ſuch kind of brutes as they moſt reſemble in their manners.

This was the doctrine of Pythagoras and his followers; who, held that the ſouls of vicious men were impriſoned in the bodies of miſerable beaſts, there to do penance for ſeveral ages, at the expiration whereof they returned again to animate men; but if they had lived virtuouſly, ſome happier brute, or even a human creature, was to be their lot. What led Pythagoras into this opinion was the perſuaſion he had that the ſoul was not of a periſhable nature; whence he concluded, that it muſt move into ſome other body upon its abandoning this. Lucan thinks this doctrine was contrived to mitigate the apprehenſion of death, by perſuading men that they only changed their lodgings, and ceaſed to live only to begin a new life.

MET

METEMTOSIS, a term in chronology, expreſſing the ſolar equation, neceſſary to prevent the new moon from happening a day too late; by which it is oppoſed to proemptoſis, which ſignifies the lunar equation neceſſary to prevent the new moon from happening a day too ſoon.

METEOR, in phyſiology, an imperfect, changeable, and mixt body, or the reſemblance of a body appearing in the atmoſphere, and formed by the action of the heavenly bodies, out of the common elements.

Meteors are of three kinds; fiery, airy, and watery. Fiery meteors conſiſt of a fat ſulphureous ſmoke ſet on fire; ſuch as falling ſtars, draco volans, the ignis fatuus, and other phænomena, appearing in the air. Airy meteors conſiſt of flatulent and ſpirituous exhalations, ſuch as winds, *&c.* Watery meteors are compoſed of vapours, or watery particles, variouſly modified by heat and cold, ſuch as clouds, rain, hail, ſnow and dew.

METHEGLIN, a drink prepared of honey, one of the moſt pleaſant and general drinks the northern parts of Europe afford. It is, according to Bailey, made as follows: Put as much new honey naturally running from the comb, into ſpring water, as that, when the honey is throughly diſſolved, an egg will not ſink to the bottom, but be juſt ſuſpended in it. Then boil the liquor for

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for an hour or more, till ſuch time as the egg ſwim above the liquor; then take it off the fire, and let it cool. When very cool, next morning, it may be barrelled up; and adding to it half an ounce of ginger, as much of cloves, as much of mace, and a quarter of an ounce of cinnamon, all groſly pounded, a ſpoonful of yeaſt may be added alſo at the bung to increaſe its fermentation. When it has done working, it may be cloſely ſtopped up; and after it has ſtood a month, it may be drawn off into bottles.

METHOD, the arrangement of our ideas in ſuch a regular order, that their mutual connection and dependence may be readily comprehended.

METHODISTS, a name at firſt given to a ſociety of religious young men at Oxford, and now applied to all thoſe who adhere to the doctrine of the church of England as taught by Whitefield, Weſley, &c. They are ſaid to be, in general, plain well-meaning people, who do not diſſent from the eſtabliſhed church; but profeſs to live with great purity, according to her articles. At their firſt appearance their teachers were charged, in the heat of their zeal, with ſeveral irregularities, and many expreſſions in their preaching which were not altogether unexceptionable: but as the civil government, with a moderation and wiſdom peculiar to the preſent time, thought fit to overlook their behaviour, they have ſince honeſtly acknowledged wherein they were miſtaken; and, in conſequence of the perfect liberty of conſcience they enjoy, have ſubſided into a more regular and peaceable conduct, agreeable to the genuine ſpirit of Chriſtianity.

METHODISTS, *Methodici*, is alſo an appellation given to a ſect of ancient phyſicians, who reduced the whole healing art to a few common principles or apearances.

METONYMY, in rhetoric, is a trope in which one name is put for another, on account of the near relation there is between them. By this trope any of the moſt ſignificant circumſtances of a thing are put for the thing itſelf. The metonymy is uſed with moſt advantage in the following caſes. 1. When the narration ſtands for the action, and what the poet or hiſtorian deſcribes he is ſaid to do; which is a lively manner of expreſſion, exceeding the common, as much as action goes beyond deſcription, or life excels painting. 2. When the name of any relation is put for the duty it requires, and the benevolence and tenderneſs that may be expected from it. Thus Anacreon ſays, that through money there is no longer any ſuch thing as brethren or parents in the world. 3. When the word which is uſed for a proper name, is either taken from the perſon's country, family, profeſſion, perſonal circumſtance, or reſemblance to ſome other: thus, as Sardanapalus was a monſter of debauchery, and Nero of cruelty, to call a very debauched perſon a Sardalapalus, and a cruel one Nero, brands them much deeper than to call one debauched, and the other cruel.

METOPE, in architecture, is the interval, or ſquare ſpace between the triglyphs of the doric frieze, which among the ancients uſed to be painted or adorned with carved work, repreſenting the heads of oxen, or utenſils uſed in ſacrifices.

METOPOSCOPY, the pretended art of knowing a perſon's diſpoſition and manners, by viewing the traces and lines in the face.

METRE, in poetry, a ſyſtem of feet of a juſt length.

The different metres in poetry, are the different manners of ordering and combining the quantities, or the long and ſhort ſyllables; thus hexameter, pentameter, iambic, ſapphic verſes, &c. conſiſt of different metres, or meaſures.

In Engliſh verſes, the metres are extremely various and arbitrary, every poet being at liberty to introduce any new form that he pleaſes. The moſt uſual are the heroic, generally conſiſting of five long and five ſhort ſyllables, and verſes of four feet, and of three feet and a cæſura or ſingle ſyllable.

METRETES, an ancient meaſure of capacity, containing a little more than nine gallons.

METROPOLIS, the capital or principal city of a country or province.

The term metropolis is alſo applied to archiepiſcopal churches, and ſometimes to the principal or mother church of a city.

METZ, a city of Germany, in the duchy of Lorrain, capital of the biſhoprick of Metz, ſituated thirty miles north of Nancy.

MEXICO, the metropolis of New Spain at preſent, and formerly of the empire of Mexico, ſituated in W. long. 103°, N. lat. 20°.

This province of New Spain in America is now divided into Old and New Mexico.

Old MEXICO, ſituated between 83 and 116 degrees of W. long. and between 8 and 28 degrees N. lat. is bounded by New Mexico, or Granada, on the north; by the gulph of Mexico, on the north-eaſt; by Terra-firma, on the ſouth-eaſt; and by the Pacific Ocean, on the ſouth-weſt.

New MEXICO, including California, ſituated between 100 and 140 degrees of W. long. and between the Tropic of Cancer and 48 degrees of N. lat. is bounded by unknown lands on the north, by Florida on the eaſt, by Old Mexico on the ſouth, and by the Pacific Ocean on the weſt.

MEZZOTINTO, a particular manner of repreſenting figures on copper, ſo as to form prints in imitation of painting in Indian ink.

The manner of making mezzotintos is very different from all other kinds of engraving and etching, ſince inſtead of forming the figures with lines and ſcratches made with the point of a graver, or by means of aqua-fortis, they are wholly formed by ſcraping and burniſhing. Mezzotintos are made in the following manner: take a well-poliſhed copper-plate, and beginning at the corner, rake or furrow the ſurface all over with a knife or inſtrument made for the purpoſe, firſt one way, and then the other, till the whole is of a regular roughneſs, without the laſt ſmooth part to be ſeen; in which ſtate, if a paper was to be worked off from it at the copper-plate preſs, it would be all over black. When this is done, the plate is rubbed over with charcoal, black chalk, or black lead, and then the deſign is drawn with white chalk; after which the out-lines are traced

out,

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out; and the plate finiſhed by ſcraping off the roughneſs, ſo as to leave the figure on the plate. The outlines and deepeſt ſhades are not ſcraped at all, the next ſhades are ſcraped but little, the next more, and ſo on, till the ſhades gradually falling off, leave the paper white, in which the places the plate is neatly burniſhed.

By an artful diſpoſition of the ſhades, and different parts of a figure on different plates, mezzotintos have been printed in colours, ſo as nearly to repreſent very beautiful paintings.

MIASMA, among phyſicians, denotes the contagious effluvia of peſtilential diſeaſes, whereby they are communicated to people at a diſtance.

MICA, GLIMMER, in natural hiſtory, a genus of talcs. The bright appearance of the gold and ſilver glimmers, has led ſome to imagine they were gold and ſilver ores; but the truth is, they contain not the leaſt grain of either of theſe metals, being mere talc, accidentally coloured. See TALC.

MICAH, or the *book of* MICAH, a canonical book of the Old Teſtament, written by the prophet Micah, who is the ſeventh of the twelve leſſer prophets. He is cited by Jeremiah, and propheſied in the days of Jotham, Ahaz, and Hezekiah. He cenſures the reigning vices of Jeruſalem and Samaria, and denounces the judgments of God againſt both kingdoms. He likewiſe foretells the confuſion of the enemies of the Jews, the coming of the Meſſiah, and the glorious ſucceſs of his church.

MICHAELMAS, or *feaſt of St* MICHAEL *and all angels*, a feſtival of the Chriſtian church, obſerved on the 29th of September.

MICHELIA, in botany, a genus of the polyandria polygynia claſs. The calix conſiſts of eight ſegments, and the corrolla of eight petals; and the berries contain many ſeeds. There is but one ſpecies, a native of India.

MICROCOS, in botany, a genus of the polyandria monogynia claſs. The calix conſiſts of five leaves, and the corolla of five petals. There are two ſpecies, both natives of India.

MICROCOSM, a Greek term, ſignifying the little world; uſed by ſome for man, as being ſuppoſed an epitome of the univerſe or great world.

MICROGRAPHY, the deſcription of objects too minute to be viewed without the aſſiſtance of a microſcope. See MICROSCOPE.

MICROMETER, a machine, which, by means of a ſcrew, ſerves to meaſure extremely ſmall diſtances to a great degree of accuracy.

MICROPUS, in botany, a genus of the ſyngeneſia polygamia ſegregata claſs. The receptacle is paleaceous; it has no pappus; and the corrolla have no radii. There are two ſpecies, none of them natives of Britain.

MICROSCOPE, an optical inſtrument, by means whereof very minute objects are repreſented. See OPTICS.

MIDAS-EAR-SHELL, the ſmooth ovato-oblong buccinum, with an oblong and very narrow mouth. It conſiſts of ſix volutions, but the lower one alone makes up almoſt the whole ſhell.

MID-HEAVEN, the point of the ecliptic that culminates, or in which it cuts the meridian,

MIDDLEBURG, the capital city of Zealand, one of the United Provinces, ſituated in the iſland of Welcherin, twenty-ſix miles north-eaſt of Bruges.

MIDDLESEX, a county of England, in which London, the metropolis, ſtands. It is twenty-four miles long, and only fourteen broad; and is bounded by Hertfordſhire, on the north; by the river Lea, which divides it from Eſſex, on the eaſt; by the river Thames, which ſeparates it from Surry, on the ſouth; and by the brook Coln, which divides it from Buckinghamſhire, on the weſt.

MIDHURST, a borough-town of Suſſex, ten miles north of Chicheſter; which ſends two members to parliament.

MIDWIFERY.

MIDWIFERY is the art of aſſiſting nature in bringing forth a perfect fœtus, or child, from the womb of the mother.

The knowledge of this art depends greatly on an intimate acquaintance with the anatomy of the parts of generation in women, both internal and external. But, as thoſe have already been fully deſcribed under the article ANATOMY, we muſt refer to the diffefent parts of that ſcience upon which the knowledge of midwifery depends.

For the BONES of the PELVIS, ſee ANATOMY, p. 171, *&c.*

For the PARTS of GENERATION in FEMALES, both external and internal, ſee ANATOMY, p. 274, *&c.*

For the different theories of CONCEPTION, ſee GENERATION.

Of the increaſe of the UTERUS *after conception.*

IT is ſuppoſed, that the ovum ſwims in a fluid, which it abſorbs ſo as to increaſe gradually in magnitude, till it comes in contact with all the inner ſurface of the fundus uteri; and this being diſtended in proportion to the augmentation of its contents, the upper part of the neck begins alſo to be ſtretched.

About the third month of geſtation, the ovum in bigneſs equals a gooſe egg; and then nearly one fourth of the neck, at its upper part, is diſtended equal with the fundus. At the fifth month, the fundus is increaſed to a much greater magnitude, and riſes upwards to the middle ſpace betwixt the upper part of the pubes and the navel; and at that period, one half of the neck is extended. At the ſeventh month, the fundus reaches as high as the navel; at the eighth month, it is advanced midway between the navel and *ſcrobiculus cordis*; and in the ninth month, is raiſed quite up to this laſt mentioned part, the neck of the womb being then altogether diſtended. See Plate CXI. fig. 1, 2, 3.

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FIG. 1. Gives a front-view of the uterus *in ſitu* ſuſpended in the vagina; the anterior parts of oſſa iſchium, with the oſſa pubis, pudenda, perinæum, and anus, being removed in order to ſhew the internal parts.

A, The laſt vertebra of the loins.
BB, The oſſa ilium.
CC, The acetabula.
DD, The inferior and poſterior parts of the oſſa iſchium.
E, The part covering the extremity of the coccyx.
F, The inferior part of the rectum.
GG, The vagina cut open longitudinally, and ſtretched on each ſide of the collum uteri, to ſhew in what manner the uterus is ſuſpended in the ſame.
HH, Part of the veſica urinaria ſtretched on each ſide of the vagina, and inferior part of the fundus uteri.
I, The collum uteri.
K, The fundus uteri.
LL, The tubi Fallopiani and fimbriæ.
MM, The ovaria.
NN, The ligamenta lata and rotunda.
OO, The ſuperior part of the rectum.

FIG. 2. Gives a front-view of the uterus in the beginning of the firſt month of pregnancy; the anterior part being removed that the embryo might appear through the amnios, the chorion being diſſected off.

A, The fundus uteri.
B, The collum uteri, with a view of the rugous canal that leads to the cavity of the fundus.
C, The os uteri.

FIG. 3. In the ſame view and ſection of the parts as in fig. 1. ſhews the uterus as it appears in the ſecond or third month of pregnancy.

F, The anus.
G, The vagina, with its plicæ.
HH, The poſterior and inferior part of the urinary bladder extended on each ſide; the anterior and ſuperior part being removed.
II, The mouth and neck of the womb, as raiſed up when examining the ſame by the touch, with one of the fingers in the vagina.
KK, The uterus as ſtretched in the ſecond or third month, containing the embryo, with the placenta adhering to the fundus.

Now that the whole ſubſtance of the uterus is ſtretched, the neck and os internum, which were at firſt the ſtrongeſt, become the weakeſt part of the womb, and the ſtretching force being ſtill continued by the increaſe of the fœtus and ſecundines, which are extended by the incloſed waters in a globular form, the os uteri begins gradually to give way. In the beginning of its dilatation, the nervous fibres in this place, being more ſenſible than any other part of the uterus, are irritated, and yield an uneaſy ſenſation; to alleviate which, the woman ſqueezes her uterus, by contracting the abdominal muſcles, and at the ſame time filling the lungs with air, by which the diaphragm is kept down; the pain being rather increaſed than abated by this ſtraining, is communicated to all the neighbouring parts, to which the ligaments and veſſels are attached, ſuch as the back, loins, and inſide of the thighs; and by this compreſſion of the uterus, the waters and membranes are ſqueezed againſt the os uteri, which is, of conſequence, a little more opened. See fig. 4, 5, 6. of Plate CXI.

FIG. 4. In the ſame view and ſection of the parts with the former figures, repreſents the uterus in the eighth or ninth month of pregnancy.

A, The uterus as ſtretched to near its full extent, with the waters, and containing the fœtus entangled in the funis, the head preſenting at the upper part of the pelvis.
BB, The ſuperior part of the oſſa ilium.
CC, The acetabula.
DD, The remaining poſterior parts of the oſſa iſchium.
E, The coccyx.
F, The inferior part of the rectum.
GGG, The vagina ſtretched on each ſide.
H, The os uteri, the neck being ſtretched to its full extent or entirely obliterated.
II, Part of the veſica urinaria.
KK, The placenta, at the ſuperior and poſterior part of the uterus.
LL, The membranes.
M, The funis umbilicalis.

FIG. 5. Gives a front view of twins *in utero* in the beginning of labour.

A, The uterus as ſtretched, with the membranes and waters.
BB, The ſuperior parts of the oſſa ilium.
CC, The acetabula.
DD, The oſſa iſchium.
E, The coccyx.
F, The lower part of the rectum.
GG, The vagina.
H, The os internum ſtretched open about a finger-breadth, with the membranes and waters in time of labour-pains.
II, The inferior part of the uterus, ſtretched with the waters, which are below the head of the child that preſents.
KK, The two placentas adhering to the poſterior part of the uterus, the two fœtus's lying before them, one with its head in a proper poſition at the inferior part of the uterus, and the other ſituated preternaturally with the head to the fundus: the bodies of each are here entangled in their proper funis, which frequently happens in the natural as well as preternatural poſitions.
LLL, The membranes belonging to each placenta.

FIG. 6. Shews, in a lateral view and longitudinal diviſion of the parts, the gravid uterus when labour is ſomewhat advanced.

A, The loweſt vertebra of the back; the diſtance from which to the laſt mentioned vertebra is here ſhewn by dotted lines.
CC, The uſual thickneſs and figure of the uterus when extended by the waters at the latter end of pregnancy.

D, The

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Fig. 1.

Fig. 2.

Fig. 4.

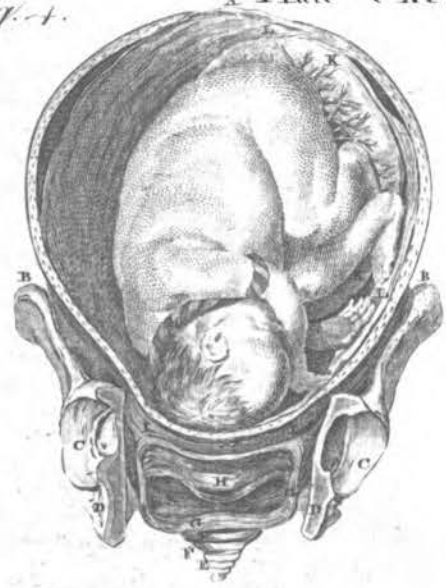


Fig. 3.

Fig. 5.

Fig. 6.

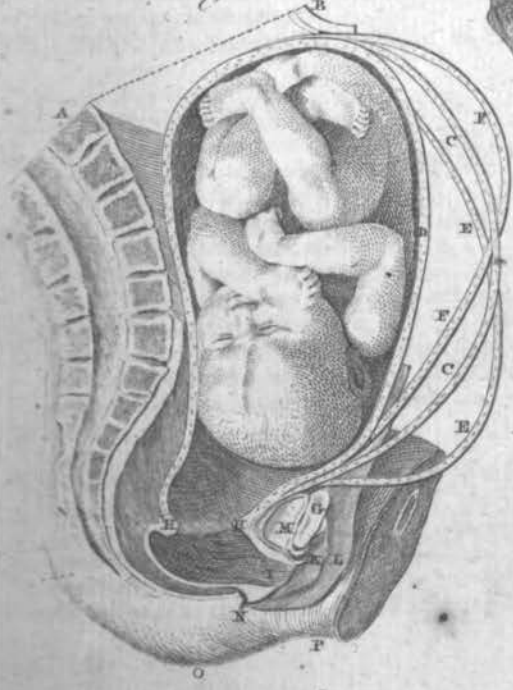
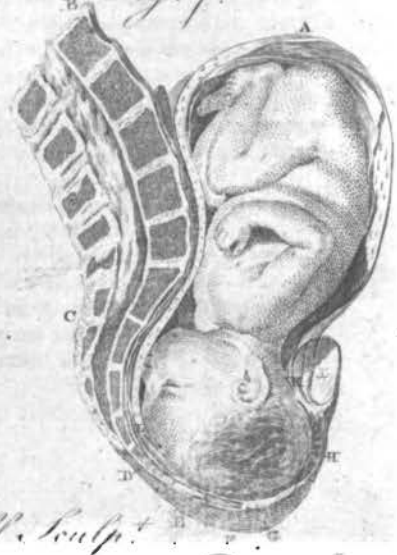


Fig. 7.



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D, The ſame contracted and grown thicker after the waters are evacuated.
EE, The figure of the uterus when pendulous.
FF, The figure of the uterus when ſtretched higher than uſual, which generally occaſions vomitings and difficulty of breathing.
G, The os pubis of the left ſide.
HH, The os internum.
I, The vagina.
K, The left nympha.
L, The labium pudendi of the ſame ſide.
M, The remaining portion of the bladder.
N, The anus.
OP, The left hip and thigh.

The woman being unable to continue this effort, for any length of time, from the violence of the pain it occaſions, and the ſtrength of the muſcles being thereby a little exhauſted and impaired, the contracting force abates; the tenſion of the os tincæ being taken off, it becomes more ſoft, and contracts a little; ſo that the nervous fibres are relaxed. This remiſſion of pain the patient enjoys for ſome time, until the ſame increaſing force renews the ſtretching pains, irritation, and ſomething like a teneſmus at the os uteri; the compreſſion of the womb again takes place, and the internal mouth is a little more dilated, either by the preſſure of the waters and membranes, or when the fluid is in ſmall quantity, by the child's head forced down by the contraction of the uterus, which in that caſe is in contact with the body of the fœtus. See Plate CXI. where

FIG. 7. Shews the forehead of the fœtus turned backwards to the os ſacrum, and the occiput below the pubes, by which means the narrow part of the head is to the narrow part of the pelvis, that is, between the inferior parts of the oſſa iſchium.
A, The uterus contracted cloſely to the fœtus after the waters are evacuated.
BCD, The vertebræ of the loins, os ſacrum, and coccyx.
E, The anus.
F, The left hip.
G, The perinæum.
H, The os externum beginning to dilate.
I, The os pubis of the left ſide.
K, The remaining portion of the bladder.
L, The poſterior part of the os uteri.

In this manner the labour-pains begin, and continue to return periodically, growing ſtronger and more frequent, until the os uteri is fully dilated, and the membranes are depreſſed and broke; ſo that the waters are diſcharged, the uterus contracts, and, with the aſſiſtance of the muſcles, the child is forced along and delivered.

Of ABORTIONS.

A MISCARRIAGE that happens before the tenth day, was formerly called an efflux, becauſe the embryo and ſecundines are not then formed, and nothing but the liquid conception, or genitura, is diſcharged. From the tenth day to the third month it was known by the term expulſion, the embryo and ſecundines being ſtill ſo ſmall, that the woman is in no great danger from violent flooding.

If ſhe parted with her burden betwixt that period and the ſeventh month, ſhe was ſaid to ſuffer an abortion; in which caſe ſhe underwent greater danger, and was delivered with more difficulty than before; becauſe the uterus and veſſels being more diſtended, a larger quantity of blood was loſt in a ſhorter time, the fœtus was increaſed in bulk, and the neck of the womb is not yet fully ſtretched: beſides, ſhould the child be born alive, it will be ſo ſmall and tender that it will not ſuck, and ſcarce receive any ſort of nouriſhment.

When delivery happens between the ſeventh month and full time, the woman is ſaid to be in labour: but, inſtead of theſe diſtinctions, if ſhe loſes her burden at any time from conception to the ſeventh or eighth, or even in the ninth month, we now ſay indiſcriminately, ſhe has miſcarried.

The common term of pregnancy is limited to nine ſolar months, reckoning from the laſt diſcharge of the catamenia: yet in ſome, though very few, uterine geſtation exceeds that period.

Of falſe CONCEPTIONS *and* MOLES.

IT was formerly ſuppoſed, that if the parts of the embryo and ſecundines were not ſeparated and diſtinctly formed from the mixture of the male and female ſemen, they formed a maſs, which, when diſcharged before the fourth month, was called a falſe conception; if it continued longer in the uterus, ſo as to increaſe in magnitude, it went under the denomination of a *mola*. But theſe things are now to be accounted for in a more probable and certain manner. Should the embryo die (ſuppoſe in the firſt or ſecond month,) ſome days before it is diſcharged, it will ſometimes be entirely diſſolved; ſo that, when the ſecundines are delivered, there is nothing elſe to be ſeen. In the firſt month, the embryo is ſo ſmall and tender, that this diſſolution will be performed in twelve hours; in the ſecond month, two, three, or four days will ſuffice for this purpoſe; and even in the third month, it will be diſſolved in fourteen or fifteen: beſides the blood frequently forms thick laminæ round the ovum, to the ſurface of which they adhere ſo ſtrongly, that it is very difficult to diſtinguiſh what part is placenta, and what membrane. Even after the embryo and placenta are diſcharged, in the ſecond or third month, the mouth and neck of the womb are often ſo cloſely contracted, that the fibrous part of the blood is retained in the fundus, ſometimes to the fifth or ſeventh day; and when it comes off, exhibits the appearance of an ovum, the external ſurface, by the ſtrong preſſure of the uterus, reſembling a membrane; ſo that the whole is miſtaken for a falſe conception.

This ſubſtance, in bigneſs, commonly equals a pigeon or hen egg; or if it exceeds that ſize, and is longer retained, is diſtinguiſhed by the appellation of *mola*: but this laſt generally happens in women betwixt the age of forty-five and fifty, or later, when their menſes begin to diſappear; ſometimes from internal or external accidents that may produce continued floodings. If the catamenia

have

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have ceaſed to flow for ſome time in elderly women, and return with pain, ſuch a ſymptom is frequently the forerunner of a cancer; before or after this happens, ſometimes a large fleſh-like ſubſtance will be diſcharged with great pain, reſembling that of labour; and upon examination, appears to be no more than the fibrous part of the blood, which aſſumes that form by being long preſſed in the uterus or vagina.

In this place, it will not be amiſs to obſerve, that the glands of the uterus and vagina will ſometimes increaſe, and diſtend the adjacent parts to a ſurpriſing degree; if (for example) one of the glands of the uterus be ſo obſtructed as that there is a preſſure on the returning vein and excretory duct, the arterial blood will gradually ſtretch the ſmaller veſſels, and conſequently increaſe the ſize of the gland, which will grow larger and larger, as long as the force of the impelled fluid is greater than the reſiſtance of the veſſels that contain it; by which means, a very ſmall gland will be enlarged to a great bulk, and the uterus gradually ſtretched as in uterine geſtation, though the progreſs may be ſo ſlow as to be protracted for years inſtead of months. Nevertheleſs, the os internum will be dilated, and the gland (if not too large to paſs) will be ſqueezed into the vagina, provided it adheres to the uterus, by a ſmall neck; nay, it will lengthen more and more, ſo as to appear on the outſide of the os externum; in which caſe, it may be eaſily ſeparated by a ligature. This diſeaſe will be the ſooner known and eaſier remedied, the lower its origin in the uterus is. But ſhould the gland take its riſe in the vagina, hard by the mouth of the womb, it will ſhew itſelf ſtill ſooner, and a ligature may be eaſily introduced, provided the tumour is not ſo large as to fill up the cavity and hinder the neck of it from being commodiouſly felt. Though the greateſt difficulty occurs, when the gland is confined to the uterus, being too much enlarged to paſs through the os internum.

Sometimes all, or moſt of the glands in the uterus, are thus affected, and augment the womb to ſuch a degree, that it will weigh a great many pounds, and the woman is deſtroyed by its preſſure upon the ſurrounding parts: but, ſhould this indolent ſtate of the tumour be altered by any accident that will produce irritation and inflammation, the parts will grow ſchirrous, and a cancer enſue.

This misfortune, for the moſt part, happens to women, when their menſtrual evacuations leave them; and ſometimes (though ſeldom) to child bearing women, in conſequence of ſevere labour.

Of the Placenta.

The ovum is formed of the placenta with the chorion and amnion, which are globularly diſtended by the incloſed waters that ſurround the child. The placenta is commonly of a round figure, ſomewhat reſembling an oat-cake, about ſix inches in diameter, and one inch thick in the middle, growing a little thinner towards the circumference: it is compoſed of veins and arteries, which are divided into an infinite number of ſmall branches, the venous parts of which unite in one large tube, called the umbilical vein, which brings back the blood, and is ſuppoſed to carry along the nutritive fluid from the veſſels of the chorion and placenta, to the child, whoſe belly it perforates at the navel; from thence paſſing into the liver, where it communicates with the vena portarum and cava. It is furniſhed with two arteries, which ariſe from the internal iliacs of the child, and running up on each ſide of the bladder, perforates the belly where the umbilical vein entered; then they proceed to the placenta, in a ſpiral line, twining round the vein, in conjunction with which they form the funiculus umbilicalis, which is commonly four or five hand breadths in length, ſometimes only two or three, and ſometimes it extends to the length of eight or ten. The two arteries, on their arrival at the inner ſurface of the placenta, are divided and ſubdivided into minute branches, which at laſt end in ſmall capillaries that inoſculate with the veins of the ſame order. Theſe arteries, together with the umbilical vein, are ſuppoſed to do the ſame office in the placenta which is afterwards performed in the lungs by the pulmonary artery and vein, until the child is delivered and begins to breathe: and this opinion ſeems to be confirmed by the following experiments. If the child and placenta are both delivered ſuddenly, or the laſt immediately after the firſt; and if the child, though alive, does not yet breathe; the blood may be felt circulating, ſometimes ſlowly, at other times with great force, through the arteries of the funis to the placenta, and from thence back again to the child, along the umbilical vein. When the veſſels are ſlightly preſſed, the arteries ſwell between the preſſure and the child, while the vein grows turgid between that and the placenta, from the ſurface of which no blood is obſerved to flow, although it be lying in a baſon, among warm water. As the child begins to breathe, the circulation, though it was weak before, immediately grows ſtronger and ſtronger, and then in a few minutes the pulſation in the navel-ſtring becomes more languid, and at laſt entirely ſtops. If, after the child is delivered, and the navel ſtring cut, provided the placenta adheres firmly to the uterus, which is thereby kept extended; or, if the womb is ſtill diſtended by another child; no more blood flows from the umbilical veſſels, than what ſeemed to be contained in them at the inſtant of cutting; and this, in common caſes, does not exceed the quantity of two or three ounces; and finally, when, in conſequence of violent floodings, the mother expires, either in time of delivery, or ſoon after it, the child is ſometimes found alive and vigorous, eſpecially if the placenta is ſound; but if tore, then the child will loſe blood as well as the mother.

The external ſurface of the placenta is divided into ſeveral lobes, that it may yield and conform itſelf more commodiouſly to the inner ſurface of the uterus, to which it adheres, ſo as to prevent its being ſeparated by any ſhock or blows upon the abdomen, unleſs when violent.

Thoſe groupes of veins and arteries which enter into the compoſition of the placenta receive external coats from the chorion, which is the outward membrane of the ovum, thick and ſtrong, and forms three fourths of the external globe that contains the waters and the child; the remaining part being covered by the placenta; ſo that theſe two in conjunction conſtitute the whole external ſurface of the ovum. Some indeed alledge, that theſe are inveloped with a cribriform or cellular ſubſtance, by which

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which they ſeem to adhere by contact only, to the uterus; and that the inner membrane of the womb is full of little glands, whoſe excretory ducts opening into the fundus and neck, ſecrete a ſoft thin mucus, to lubricate the whole cavity of the uterus, which beginning to ſtretch in time of geſtation, the veſſels that compoſe theſe glands are alſo diſtended; conſequently, a greater quantity of this mucus is ſeparated and retained in this cribriform and cellular ſubſtance, the abſorbing veſſels of which take it in, and convey it along the veins, for the nouriſhment of the child. The womb being therefore diſtended in proportion to the increaſe of the child, thoſe glands are alſo proportionably enlarged; by which means, a larger quantity of the fluid is ſeparated, becauſe the nutriment of the child muſt be augmented in proportion to the progreſs of its growth; and this liquor undergoes an alteration in quality as well as in quantity, being changed from a clear thin fluid into the more viſcous conſiſtence of milk. In ſome caſes this mucus hath been diſcharged from the uterus in time of pregnancy, and both mother and child weakened by the evacuation, which may be occaſioned by the chorion's adhering too looſely, or being in one part actually ſeparated from the womb.

Formerly, it was taken for granted by many, that the placenta always adhered to the fundus uteri; but this notion is refuted by certain obſervations, in conſequence of which we find it as often ſticking to the ſides, back and fore-parts, and ſometimes as far down as the inſide of the os uteri. See Plate CXI.

When the placenta is delivered, and no other part of the membrane tore except that through which the child paſſed, the opening is near the edge or ſide of the placenta, and ſeldom in the middle of the membranes; and a hog's bladder being introduced at this opening, and inflated, when lying in water, will ſhew the ſhape and ſize of the inner ſurface of the womb, and plainly diſcover the part to which the placenta adhered.

The chorion is, on the inſide, lined with the amnion, which is a thin tranſparent membrane, without any veſſels ſo large as to admit the red globules of blood; it adheres to the chorion by contact, and ſeems to form the external coat of the funis umbilicalis.

This membrane contains the ſerum, in which the child ſwims: which fluid is ſuppoſed to be furniſhed by lymphatic veſſels that open into the inner ſurface of the amnion. If this liquid is neither abſorbed into the body of the fœtus, nor taken into the ſtomach by ſuction at the mouth, there muſt be abſorbing veſſels in this membrane, in the ſame manner as in the abdomen and other cavities of the body, where there is a conſtant renovation of humidity.

The quantity of this fluid, in proportion to the weight of the fœtus, is much greater in the firſt than in the laſt month of geſtation, being in the one perhaps ten times the weight of the embryo; whereas, in the other, it is commonly in the proportion of one to two: for, ſix pounds of water ſurrounding a fœtus that weighs twelve pounds, is reckoned a large proportion, the quantity being often much leſs; nay, ſometimes there is very little or none at all.

In moſt animals of the brute ſpecies, there is a third membrane called allantois, which reſembles a long and wide blind-gut, and contains the urine of the fœtus: it is ſituated between the chorion and amnion, and communicates with the urachus that riſes from the fundus of the bladder, and runs along with the umbilical veſſels, depoſiting the urine in this reſervoir, which is attached to its other extremity. This bag hath not yet been certainly diſcovered in the human fœtus, the urachus of which, though plainly perceivable, ſeems hitherto to be quite imperforated.

From the foregoing obſervations upon nutrition, it ſeems probable, that the fœtus is rather nouriſhed by the abſorption of the nutritive fluid into the veſſels of the placenta and chorion, than from the red blood circulated in full ſtream from the arteries of the uterus to the veins of the placenta, and returned by the arteries of the laſt to the veins of the firſt, in order to be renewed, refined, and made arterial blood in the lungs of the mother.

Of the CHILD's *ſituation in the* UTERUS.

THE embryo or fœtus, as it lies in the uterus, is nearly of a circular or rather oval figure, which is calculated to take up as little ſpace as poſſible: the chin reſts upon the breaſts, the thighs are preſſed along the belly, the heels applied to the breech, the face being placed between the knees, while the arms croſs each other round the legs. The head, for the moſt part, is down to the lower part of the uterus; and the child being contracted into an oval form, the greateſt length is from head to breech: but the diſtance from one ſide to the other is much leſs than that from the fore to the back part; becauſe the thighs and legs are doubled along the belly and ſtomach, and the head bended forwards on the breaſt. The uterus being confined by the vertebræ of the loins, the diſtance from the back to the fore-part of it muſt be leſs than from ſide to ſide; ſo that, in all probability, one ſide of the fœtus is turned towards the back, and the other to the fore-part of the womb: but, as the back part of the uterus forms a little longiſh cavity on each ſide of the vertebræ, the fore-parts of the fœtus may therefore for the moſt part tilt more backwards than forwards.

It has been generally ſuppoſed, that the head is turned up to the fundus, and the breech to the os uteri, with the fore-parts towards the mother's belly; and that it remains in this ſituation till labour begins, when the head comes downwards, and the face is turned to the back of the mother. Some alledge, that the head precipitates about the end of the eighth or beginning of the ninth month, by becoming ſpecifically heavier than the reſt of the body. Others affirm, that as the child increaſes in bulk, eſpecially during the two laſt months, the proportion of ſurrounding water muſt be diminiſhed, ſo as that it is confined in its motion, and, in ſtruggling to alter its poſition, the head is moved to the os tinicæ, where it remains till delivery. The particulars of this and other theories may be found in *Mauriceau*, *Le Motte*, *Simpſon*, and *Old*. But, from the following obſervations, it ſeems more probable, that the head is, for the moſt part, turned down to the lower part of the uterus from conception to delivery.

In the firſt month, according to ſome writers, the em-

bryo exhibites the figure of a tadpole, with a large head and ſmall body or tail, which gradually increaſes in magnitude, till the arms and thighs begin to bud or ſtrut out, like ſmall nipples, from the ſhoulders and breech: two black ſpecks appear on each ſide of the head, with a little hole or opening between them, which in the ſecond month are eaſily diſtinguiſhed to be the eyes and mouth. See Plate CXI. fig. 2. The legs and arms are gradually formed, while the body turns larger; but the fingers are not ſeparated or diſtinct, till the latter end of the ſecond or beginning of the third month. See Plate CXI. fig. 3. This is commonly the caſe; but ſometimes the bulk and appearance differ conſiderably in different embryos of the ſame age. The younger the embryo, the larger and heavier is the head in proportion to the reſt of the body; and this is the caſe in all the different gradations of the fœtus; ſo that when dropt or ſuſpended by the navel ſtring in water, the head muſt ſink lowermoſt of courſe. Beſides, when women miſcarry in the fourth, fifth, ſixth, and ſeventh months, the head for the moſt part preſents itſelf, and is firſt delivered. See Plate CXI. fig. 3. By the touch in the vagina, the head is frequently felt in the ſeventh, ſometimes in the ſixth, but more frequently in the eighth month; and if the ſame women are thus examined, from time to time, till the labour begins, the head will always be felt of a round firm ſubſtance at the fore-part of the brim of the pelvis, betwixt the os internum and pubes, through the ſubſtance of the vagina and uterus. See Plate CXI. fig. 4. But all thoſe opinions are liable to objections. If the deſcent of the head proceeded from its ſpecific gravity, we would always find it at the os internum, becauſe this reaſon would always prevail; if it were owing to a diminiſhed proportion of water, why ſhould we often find the breech preſented, even when there is a quantity of that fluid large enough to give the head free liberty to riſe again towards the fundus, or (according to the other opinion) to ſink down by its ſpecific gravity to the os internum? Some, indeed, ſuppoſe, that the head always preſents itſelf, except when it is hindered by the funis umbilicals twiſting round the neck and body, ſo as to impede the natural progreſs: but, were this ſuppoſition juſt, when we turn and deliver by the feet thoſe children that preſented in a preternatural way, we ſhould always find them more or leſs circumvoluted by the navel-ſtring: the funis is as often found twiſted round the neck and body when the head preſents as in any other caſe. That the head is downwards all the time of geſtation, ſeems, on the whole, to be the moſt reaſonable opinion, though it be liable to the objection already mentioned, and ſeems contradictory to the obſervation of ſome authors, who alledge, that in opening women that died in the fifth, ſixth, or ſeventh month, they have found the child's head towards the fundus uteri. But as it lies as eaſy in one poſture as in another, till the birth, this diſpute is of leſs conſequence in the practice of midwifery. It may be uſeful to ſuggeſt, that the wrong poſture of the child in the uterus may proceed,

1. From circumvolutions in the funis umbilicalis. See Plate CXIII. fig. 1. which repreſents, in a front view of the pelvis, the breech of the fœtus preſenting, and dilating the os internum, the membranes being too ſoon broke. The fore-parts of the child are to the poſterior part of the uterus; and the funis, with a knot upon it, ſurrounds the neck, arms, and body.

Or, 2. When there is little or no water ſurrounding the child, it may move into a wrong poſition, and be confined there by the ſtricture of the uterus. See Plate CXIII. fig. 2, 3, 4.

FIG. 2. is the reverſe of fig. 1. the fore parts of the child being to the fore-part of the uterus.

FIG. 3. repreſents, in a front view of the pelvis, the fœtus compreſſed, by the contraction of the uterus, into a round form, the fore-parts of the former being towards the inferior part of the latter, and one foot and hand fallen down into the vagina. In this figure, the anterior part of the pelvis is removed, by a longitudinal ſection through the middle of the foramen magnum.

AA, The ſuperior parts of the oſſa ilium.
BB, The uterus.
C, The mouth of the womb ſtretched and appearing in
OOOO, The vagina.
D, The inferior and poſterior part of the os externum.
EEEE, The remaining parts of the oſſa pubis and iſchium.
FFFF, The membrana adipoſa.

FIG. 4. repreſents, in the ſame view with fig. 3. the fœtus in the contrary poſition; the breech and fore-parts being towards the fundus uteri, the left arm in the vagina, and the fore arm without the os externum, the ſhoulder being likewiſe forced into the os uteri.

Or, laſtly, The wrong poſition of the child may be the effect of a pendulous belly or narrow pelvis, when the head lies forward over the pubis. See Plate CXI. fig. 6. See alſo Plate CXII. fig. 6. and 7.

FIG. 6. gives a lateral internal view of a diſtorted pelvis, divided longitudinally, with the head of a fœtus of the ſeventh month paſſing the ſame.

ABC, The os ſacrum and coccyx.
D, The os pubis of the left ſide.
E, The tuberoſity of the os iſchium of the ſame ſide.

FIG. 7. gives a ſide view of a diſtorted pelvis, divided longitudinally, with the head of a full grown fœtus ſqueezed into the brim, the parietal bones decuſſating each other, and compreſſed into a conical form.

ABC, The os ſacrum and coccyx.
D, The os pubis of the left ſide.
E, The tuberoſity of the os iſchium.
F, The proceſſus acutus.
G, The foramen magnum.

Of TOUCHING.

TOUCHING is performed by introducing the fore-finger lubricated with pomatum into the vagina, in order to feel the os internum and neck of the uterus; and ſometimes into the rectum, to diſcover the ſtretching of the fundus. By ſome, we are adviſed to touch with the middle finger, as being the longeſt; and by others, to employ both that and the firſt: but the middle is too much encumbered by that on each ſide, to anſwer the purpoſe fully,

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fully; and when two are introduced together, the patient never fails to complain. The deſign of touching is to be informed whether the woman is, or is not with child; to know how far ſhe is advanced in her pregnancy; if ſhe is in danger of a miſcarriage; if the os uteri be dilated; and in time of labour to form a right judgment of the caſe, from the opening of the os internum, and the preſſing down of the membranes with their waters; and laſtly, to diſtinguiſh what part of the child is preſented.

It is generally impracticable to diſcover, by a touch in the vagina, whether or not the uterus is impregnated, till after the fourth month: then the beſt time for examination is the morning, when the woman is faſting, after the contents of the bladder and rectum have been diſcharged; and ſhe ought, if neceſſary, to ſubmit to the inquiry in a ſtanding poſture; becauſe, in that caſe, the uterus hangs lower down in the vagina, and the weight is more ſenſible to the touch than when ſhe lies reclined. One principal reaſon of our uncertainty is, when we try to feel the neck, the womb riſes up on our preſſing againſt the vagina, at the ſide of the os internum, (ſee Plate CXI. fig. 3.) and in ſome, the vagina feels very tenſe; but, when the fundus uteri is advanced near the navel, the preſſure from above keeps down the os internum ſo much, that you can generally feel both the neck, and, above that, the ſtretching of the under part of the uterus. See Plate. CXI. fig. 3.

There is no conſiderable variation to be felt in the figure of the os internum, except in the latter end of pregnancy, when it ſometimes grows larger and ſofter, (ſee Plate CXI. fig. 4.) nor do the lips ſeem to be more cloſed in a woman with child than in another, eſpecially in the beginning of pregnancy: but, in both caſes the os uteri is felt like the mouth of a young puppy or tench. In ſome the lips are very ſmall; in others, large; and ſometimes, though ſeldom, ſmoothed over or pointed. In many woman, who have formerly had children and difficult labours, the lips are large, and ſo much ſeparated, as to admit the tip of an ordinary finger; but a litle higher up, the neck ſeems to be quite cloſed.

In the firſt four months, the neck of the womb may be felt hanging down in the vagina, by puſhing up the finger by the ſide of the os internum; but the ſtretching of the uterus and upper part of the neck cannot be perceived till the fifth, and ſometimes the ſixth month; and even then, the uterus muſt be kept down by a ſtrong preſſure upon the belly.

The ſtretching of the fundus is ſometimes felt by the finger introduced into the rectum, before it can be perceived in the vagina; becauſe, in this laſt method, the uterus recedes from the touch, and riſes too high to be accurately diſtinguiſhed; whereas the finger being introduced into the rectum, paſſes along the back of the womb almoſt to the upper part of the fundus, which, in an unimpregnated ſtate, is felt flat on the back part and jetting out at the ſides; but the impregnated uterus is perceived like a large round tumour.

About the fifth or ſixth month, the upper part of the uterus is ſo much ſtretched, as to riſe three or four inches above the os pubis, or to the middle ſpace between that and the navel; ſo that, by preſſing the hand on the belly, eſpecially of lean women, it is frequently perceived; and if, at the ſame time, the index of the other hand be introduced in the vagina, the neck will ſeem ſhortened, particulary at the fore-part and ſides, and the weight will be ſenſibly felt; but, if the parietes of the abdomen are ſtretched after eating, one may be deceived by the preſſure of the ſtomach, becauſe weight and preſſure are the ſame. But all theſe ſigns are more perceptible towards the latter end of pregnancy; and in ſome women the os internum is felt a little open ſome weeks before the full time, though generally it is not opened till a few days before labour begins.

From the fifth to the ninth month, the neck of the uterus becomes ſhorter and ſhorter, and the ſtretching of the womb grows more and more perceptible. In the ſeventh month, the fundus riſes as high as the navel; in the eight month, to the middle ſpace betwixt the navel and ſcrobiculus cordis; and in the ninth, even to the ſcrobiculus, except in pendulous bellies: See Plate CXI fig 4. But all theſe marks may vary in different women: for when the belly is pendulous, the parts below the navel are much more ſtretched than thoſe above, and hang over the os pubis; the fundus will then be only equal to, or a little higher than the navel; at other times, the uterus will riſe in the latter end of the ſeventh or eighth month to the ſcrobiculus cordis. The neck of the womb will, in ſome, be felt as long in the eighth, as in others in the ſixth or ſeventh month. This variation ſometimes makes the examination of the abdomen more certain than the touch of the vagina; and ſo *vice verſa*. At other times we muſt judge by both. See Plate CXI. fig. 6.

Of the ſigns of Conception, *and the equivocal ſigns of pregnant and obſtructed women.*

The ſigns of pregnancy are to be diſtinguiſhed from thoſe that belong to obſtructions, by the touch in the vagina and motion of the child, in the fifth or ſixth month; ſometimes, by the touch in the rectum, before and after the fifth month, when the tumour of the abdomen is plainly perceived.

Moſt women, a day or two before the irruption of the catamenia, labour under complaints proceeding from a plethora; ſuch as ſtretching pains in the back and loins, inſide of the thighs, breaſt and head; a ſickneſs and oppreſſion at the ſtomach, and a fulneſs of all the viſcera of the abdomen; and all theſe ſymptoms abate, and gradually vaniſh, when the diſcharge begins and continues to flow. But, if the woman be obſtructed by any accident or error in the non naturals, all thoſe complaints continue and increaſe, and are hardly diſtinguiſhable from the ſymptoms of pregnancy, till the end of the fourth month; at which period, women with child grow better, and all the complaints of fullneſs gradually wear off; whereas, thoſe who are only obſtructed, grow worſe and worſe. The fundus uteri, in the obſtructed patient, is not ſtretched; the diſorder in the ſtomach is not ſo violent as in a pregnant woman, and ſeldom accompanied with reachings; while the women with child is afflicted with a reaching every morning, and ſubject to longings beſides. The firſt labours under a fullneſs of the veſſels; the laſt, over and above this complaint, ſuffers an additional one from the

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the diſtenſion of the uterus by the impregnated ovum. Obſtructions and pregnancy are both accompanied by a ſtretching fullneſs in the breaſts; but in the laſt only, may be perceived the areola, or brown ring, round the nipples, from which, in the laſt months, a thin ſerum diſtils; but this circle is not always ſo diſcernible as in the firſt pregnancy, and even then is uncertain as well as the others.

About the fifth or ſixth month, the circumſcribed tumour or ſtretching of the uterus is felt above the os pubis; and, by this circumſcription and conſiſtence, eaſily diſtinguiſhed from the aſcites, or dropſy of the abdomen: it is alſo rounder and firmer than thoſe ſwellings that accompany obſtructions, which proceed from a general fullneſs of the veſſels belonging to the ligaments and neighbouring viſcera.

On the whole, the difficulty of diſtinguiſhing between obſtructions and pregnancy in the firſt months, is ſo great, that we ought to be cautious in giving our opinion; and never preſcribe ſuch remedies as may endanger the fruit of the womb; but rather endeavour to palliate the complaints, until time ſhall diſcover the nature of the caſe; and always judge on the charitable ſide, when life or reputation is at ſtake.

In the fifth or ſixth month of uterine geſtation, by the touch in the vagina, we perceive the neck of the womb conſiderably ſhortened, and the ſtretching of the lower part of the uterus is then ſenſibly felt between the mouth of the womb and the pubes, and on each ſide of the neck. See Plate CXI. fig. 3.

In the ſeventh month, the head of the child is frequently felt reſting againſt the lower part of the uterus, between the pubes and os internum; and being puſhed upwards towards the fundus, ſinks down again by its own gravity. All theſe diagnoſtics are more plain and certain, the nearer the patient approaches to the time of delivery.

Sometimes, the head is not felt till the eighth or ninth month; and in ſome few caſes, not till after the membranes are broke, when it is forced down by the contraction of the uterus, and ſtrong labour-pains. This circumſtance may be owing to the head's reſting above the baſin, eſpecially in a narrow pelvis; or to the diſtenſion of its belly with air after death, by which the fœtus being rendered ſpecifically lighter than the ſurrounding waters, the body floats up to the fundus, if there is a large quantity of fluid in the membranes; nor is the body always felt when the child lies acroſs the uterus.

How to diſtinguiſh the falſe LABOUR *from the true, and the means to be uſed on that occaſion.*

If the os uteri remains cloſe ſhut, it may be taken for granted that the woman is not yet in labour, notwithſtanding the pains ſhe may ſuffer: with regard to which, an accurate inquiry is to be made; and if her complaints proceed from an over ſtretching fullneſs of the uterus or veſſels belonging to the neighbouring parts, blooding in the arm or ancle, to the quantity of ſix or eight ounces, ought to be preſcribed, and repeated occaſionally. If the pains are occaſioned by a looſeneſs or diarrhœa, it muſt be immediately reſtrained with opiates. Cholic pains are diſtinguiſhed from thoſe of labour, by being chiefly confined to the belly, without going off and returning by diſtinct intervals: they are for the moſt part produced by fæces too long retained in the colon, or by ſuch ingeſta as occaſion a rarefaction or expanſion of air in the inteſtines; by which they are violently ſtretched and vellicated. This complaint muſt be removed by opening glyſters, to empty the guts of their noxious contents: and this evacuation being performed, opiates may be adminiſtered to aſſuage the pains; either to be injected by the anus, taken by the mouth, or applied externally in form of epithem or embrocation.

Sometimes, the os internum may be a little dilated, and yet it may be difficult to judge whether or not the patient be in labour; the caſe, however, may be aſcertained, after ſome attendance, by theſe conſiderations: if the woman is not arrived at her full time; if no ſoft or glary mucus hath been diſcharged from the vagina; if the pains are limited to the region of the belly, without extending to the back and inſide of the thighs; if they are ſlight, and continue without intermiſſion or increaſe; nay, if they have long intervals, and recur without force ſufficient to puſh down the waters and membranes, or child's head, to open the os internum; if this part be felt thick and rigid, inſtead of being ſoft, thin, and yielding; we may ſafely pronounce, that labour is not yet begun; and thoſe alarms are to be removed as we have directed in the caſe of falſe or cholic pains. Beſides, if the pulſe be quick and ſtrong, and the patient attacked by ſtitches in the ſides, back, or head, blooding will be likewiſe neceſſary. See Plate CXI, fig. 4.

The diviſion of LABOURS.

A NATURAL labour is when the head preſents, and the woman is delivered by her pains and the aſſiſtance commonly given: but, ſhould the caſe be ſo tedious and lingering, that we are obliged to uſe extraordinary force, in ſtretching the parts, extracting with the forcepts, or (to ſave the mother's life) in opening the head and delivering with the crotchet, it is diſtinguiſhed by the appellation of *laborious*: and the *preternatural* comprehends all thoſe caſes in which the child is brought by the feet, or the body delivered before the head. Neither do we mind how the child preſents, ſo much as the way in which it is delivered: for there are caſes in which the head preſents, and for ſeveral hours we expect the child will be delivered in the natural way; but if the woman has not ſtrength enough to force down the child's head into the pelvis, or in floodings, we are at length obliged to turn and bring it by the feet, becauſe it is ſo high that the forceps cannot be applied; and if the child is not large, nor the pelvis narrow, it were pity to deſtroy the hopes of the parents, by opening the ſkull and extracting with the crotchet. In this caſe, therefore, although the child preſents in a natural way, we are obliged to turn and deliver it in the ſame manner as if the ſhoulder, breaſt, or back, had preſented; and generally, this operation is more difficult than in either of thoſe caſes, becauſe, if the waters are all diſcharged, and the uterus cloſe contracted round the fœtus, it is more difficult to raiſe the head to the fundus. When the breech preſents, we are frequent-

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ly obliged to push it up, and search for the legs; which being found, we proceed to deliver the body, and lastly the head. If the head is large, or the pelvis narrow, and the waters not discharged, we ought, if possible, to turn the child into the natural position.

For a further illustration, and to inform young practitioners that difficult cases do not frequently occur, suppose, of three thousand women in one town or village, one thousand shall be delivered in the space of one year, and in nine hundred and ninety of these births, the child shall be born without any other than common assistance: fifty children of this number shall offer with the forehead turned to one side, at the lower part of the pelvis, where it will stop for some time; ten shall come with the forehead towards the groin, or middle of the pubes; five shall present with the breech, two or three with the face, and one or two with the ear; yet, all these shall be safely delivered, and the case be more or less lingering and laborious, according to the size of the pelvis and child, or strength of the woman: of the remaining ten that make up the thousand, six shall present with the head differently turned, and two with the breech; and these cannot be saved without stretching the parts, using the forceps or crotchet, or pushing up the child in order to bring it by the feet; this necessity proceeding either from the weakness of the woman, the rigidity of the parts; a narrow pelvis, or a large child, *&c.* the other two should lie across, and neither head nor breech, but some other part of the body, present, so that the child must be turned and delivered by the feet. Next year, let us suppose another thousand women delivered in the same place; not above three, six, or eight, shall want extraordinary assistance; nay, sometimes though seldom, when the child is young, or unusually small, and the mother has strong pains and a large pelvis, it shall be delivered even in the very worst position, without any other help than that of the labour-pains.

As the head, therefore, presents right in nine hundred and twenty of a thousand labours, all such are to be accounted natural; those of the other seventy, that require assistance, may be deemed laborious; and the other ten to be denominated laborious or preternatural, as they are delivered by the head or feet.

In order therefore to render this treatise as distinct as possible, for the sake of the reader's memory, as well as of the dependance and connection of the different labours, they are divided in the following manner: that is accounted natural, in which the head presents, and the woman is delivered without extraordinary help; those births are called laborious or nonnatural, when the head comes along with difficulty, and must be assisted either with the hand in opening the parts, or with the fillet or forceps, or even when there is a necessity for opening and extracting it with the crotchet; and those in which the child is brought by the breech or feet, are denominated preternatural, because the delivery is performed in a preternatural way.

Of the different positions of women in labour.

In almost all countries, the woman is allowed either to sit, walk about, or rest upon a bed, until the os uteri is pretty much dilated by the gravitation of the waters, or (when they are in small quantity) by the head of the fœtus, so that delivery is soon expected; when she is put in such position as is judged more safe, easy, and convenient for that purpose: but the patient may be put upon labour too prematurely, and bad consequences will attend such mistakes.

Among the *Egyptians*, *Grecians*, and *Romans*, the woman was placed upon an high stool; in Germany and Holland they use the chair which is described by Deventer and Heister; and for hot climates the stool is perfectly well adapted: but in northern countries, and cold weather, such a position must endanger the patient's health.

In the West Indies, and some parts of Britain, the woman is seated on a stool made in form of a semicircle: in other places she is placed on a woman's lap; and some, kneeling on a large cushion, are delivered backwards.

In France the position is chiefly that of half sitting and half lying, on the side or end of a bed; or the woman being in naked bed, is raised up with pillows or a bed-chair.

The London method is very convenient in natural and easy labours; the patient lies in bed upon one side, the knees being contracted to the belly, and a pillow put between them to keep them asunder. But the most commodious method is to prepare a bed and a couch in the same room; a piece of oiled cloth or dressed sheep-skin is laid across the middle of each; over the under-sheet, and above this, are spread several folds of linen, pinned or tied with tape to each side of the bed and couch; these are designed to spunge up the moisture in time of labour and after delivery, while the oiled cloths or sheep skins below preserve the feather bed from being wetted or spoiled: for this purpose, some people lay besides upon the bed several under-sheets over one another, so that by sliding out the uppermost every day, they can keep the bed dry and comfortable.

The couch must be no more than three feet wide, and provided with castors; and the woman without any other dress than that of a short or half shift, a linen skirt or petticoat open before, and a bed-gown, ought to lie down upon it, and be covered with cloaths according to the season of the year. She is commonly laid on the left side, but in that particular she is to consult her own ease; and a large sheet being doubled four times or more, one end must be slipt in below her breech, while the other hangs over the side of the couch, to be spread upon the knee of of the accoucheur or midwife, who sits behind her on a low seat. As soon as she is delivered, this sheet must be removed, a soft warm cloth applied to the os externum, and the pillow taken from betwixt her knees: she then must be shifted with a clean, warm, half shift, linen skirt, and bed-gown, and her belly kept firm with the broad head-band of the skirt, the ends of which are to be pinned across each other. These measures being taken, the couch must be run close to the bed-side, and the patient gently moved from one to another; but, if there is no couch, the bed must be furnished with the same apparatus. Some, again, are laid across the foot of the bed, to the head of which the cloaths are previously turned up till after delivery, when the woman's posture is adapted, and then they

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they are rolled down again to cover and keep her warm: by this expedient, the place of a couch is ſupplied, and the upper part of the bed preſerved ſoft and clean; whereas thoſe who are laid above the cloaths muſt be taken up and ſhifted while the bed is put to rights; in which caſe, they are ſubject to fainting; and to ſuch as are very much enfeebled, this fatigue is often fatal.

Women are moſt eaſily touched, leaſt fatigued, and kept warmeſt, when they lie on one ſide: but if the labour ſhould prove tedious, the Pariſian method ſeems moſt eligible; becauſe when the patient half ſits, half lies, the brim of the pelvis is horizontal, a perpendicular line falling from the middle ſpace between the ſcrobiculus cordis and navel, would paſs exactly through the middle of the baſin. In this poſition, therefore, the weight of the waters, and, after the membranes are broke, that of the child's head, will gravitate downwards, and aſſiſt in opening the parts; while the contracting force of the abdominal muſcles and uterus, is more free, ſtrong, and equal in this than in any other attitude. Wherefore, in all natural caſes, when the labour is lingering or tedious, this or any other poſition, ſuch as ſtanding or kneeling, ought to be tried, which by an additional force, may help to puſh along the head, and alter its direction when it does not advance in the right way. Nevertheleſs, the patient muſt by no means be too much fatigued.

When the woman lies on the the left ſide, the right hand muſt be uſed in touching, and *vice verſa;* unleſs ſhe is laid acroſs the bed; in which caſe, either hand will equally anſwer the ſame purpoſe: but, if ſhe lies athwart, with the breech towards the bed's foot, it will be moſt convenient to touch with the left hand when ſhe is upon the left ſide, and with the right when in the oppoſite poſition. And here it will not be amiſs to obſerve, that in the deſcription of all the laborious and preternatural deliveries treated of in this performance, the reader muſt ſuppoſe the woman lying on her back, except when another poſture is preſcribed; and that in natural and laborious labours, whether ſhe be upon her ſide or back, the head and ſhoulders are a little raiſed into a reclining poſture, ſo that ſhe may breathe eaſily, and aſſiſt the pains.

But in preternatural labours, when there is a neceſſity for uſing great force in turning the child, the head and ſhoulders muſt lie lower than the breech, which being cloſe to the ſide or foot of the bed, ought to be raiſed higher than either, becauſe when the pelvis is in this ſituation, the hand and arm are eaſily puſhed up in a right line, along the back part of the uterus, even to its fundus. Sometimes, however, when the feet of the child are towards the belly of the mother, they are more eaſily felt and managed when ſhe lies on her ſide. At other times, placing the woman on her knees and elbows on a low couch, according to Daventer's method, will ſucceed better, by diminiſhing in part the ſtrong reſiſtance from the preſſure and weight of the uterus and child, by which the feet will ſometimes be eaſier found and delivered: but then it is ſafer for the child, and eaſier to the operator and mother, to turn her to her back before you deliver the body and head.

Of the management of women in a NATURAL LABOUR.

IN a woman come to full time, labour commonly begins and proceeds in the following manner.

The os uteri is felt ſoft, and a little opened; the circumference being ſometimes thick, but chiefly thin: from this aperture is diſcharged a thick mucus, which lubricates the parts, and prepares them for ſtretching. This diſcharge uſually begins ſome days before, and is accounted the forerunner of real labour: at the ſame time, the woman is ſeized at intervals with ſlight pains that gradually ſtretch the os uteri, fitting it for a larger dilatation; and when labour actually begins, the pains become more frequent, ſtrong, and laſting.

At every pain, the uterus is ſtrongly compreſſed by the ſame effort which expels the contents of the rectum at ſtool, namely the inflation of the lungs, and the contraction of the abdominal muſcles.

If the child be ſurrounded with a large quantity of waters, (ſee Plate CXI. fig. 4. and 6.) the uterus cannot come in contact with the body of it, but at every pain the membranes are puſhed down by the fluid they contain, and the mouth of the womb being ſufficiently opened by this gradual and repeated diſtenſion, they are forced into the middle of the vagina; then the uterus contracts and comes in contact with the body of the child, and, if it be ſmall, the head is propelled with the waters. Here the membranes uſually break; but, if that is not the caſe, they are puſhed along towards the os externum, which they alſo gradually open, and appear on the outſide, in the form of a large round bag. Mean while, the head advances, and the os externum being by this time fully dilated, is alſo protruded; when, if the membranes, inſtead of burſting in the middle of the protuberance, are tore all round at the os externum, the child's head is covered with ſome part of them, which goes under the name of the caul, or king's hood. If the placenta is, at the ſame time, ſeparated from the uterus, and the membranes remain unbroken, the ſecundines, waters, and child, are delivered together; but, if the placenta adheres, they muſt of courſe give way: and ſhould they be tore all around from the placenta, the greateſt part of the body as well as the head of the child will be inveloped by them, from which it muſt be immediately diſengaged, that the air may have a free paſſage into the lungs.

When the head is large, ſo that it does not deſcend immediately into the pelvis, the membranes are forced down by themſelves; and being ſtretched thinner and thinner, give way; when all the waters which are farther advanced than the head, run out; then the uterus coming in contact with the body of the child, the head is ſqueezed down into the mouth of the womb, which it plugs up ſo as to detain the reſt of the waters. See Plate CXI. fig. 6.

Sometimes, when the quantity of waters is very ſmall, and the uterus embraces the body of the child, the head, covered with the membranes, is forced downwards, and gradually opens the os internum; but, at its arrival in the middle of the pelvis and vagina, part of the waters will be puſhed down before it, ſometimes in a large, and ſometimes in a ſmall proportion, towards the back part of the pelvis. At other times, when the waters are in ſmall quantity, no part of them are to be diſtinguiſhed farther than the head, which deſcending lower and lower, the attenuated membranes are ſplit upon it; while, at the ſame time, it fills up the mouth of the womb and upper

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Fig. 1.

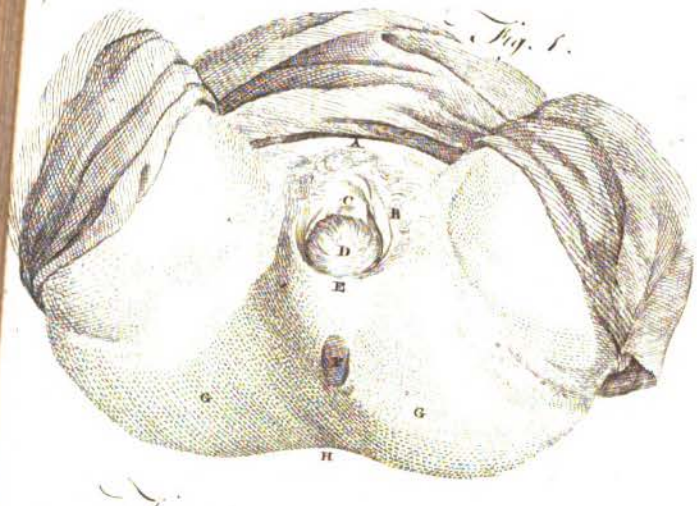

Fig. 2.

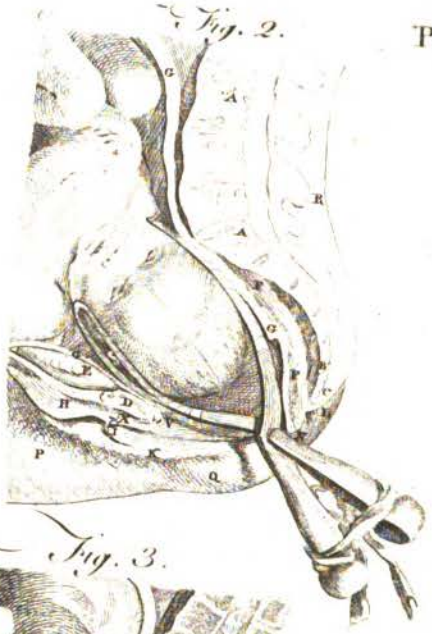

Fig. 4.

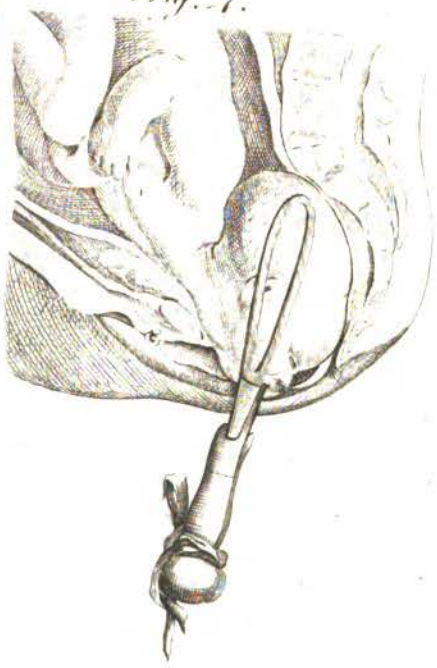

Fig. 3.

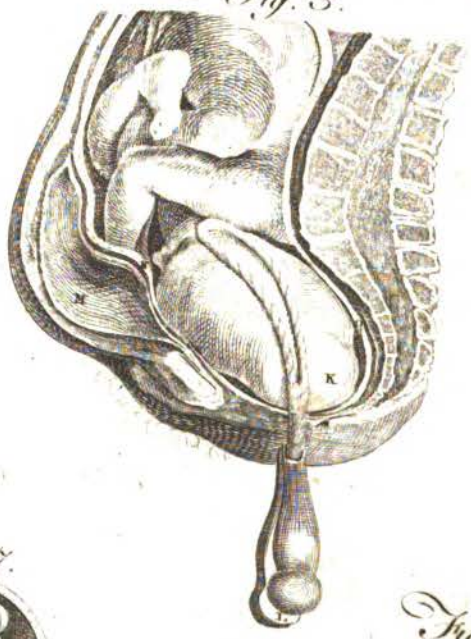

Fig. 7.

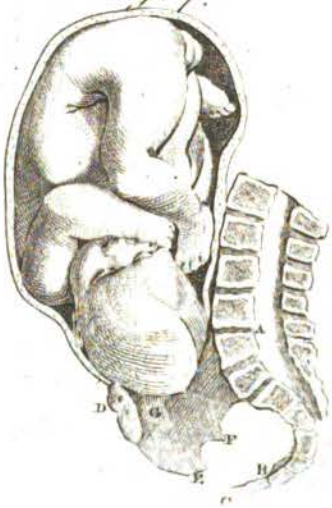

Fig. 6.

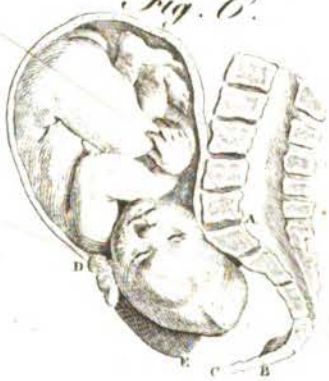

Fig. 5.

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per part of the vagina, in ſuch a manner as hinders the few remaining waters from being diſcharged at once; though in every pain, a ſmall quantity diſtils on each ſide of the head, for lubricating the parts, ſo as that the child may ſlip along the more eaſily.

The uterus contracts, the pains become quicker and ſtronger, the crown of the head is puſhed down to the lower part of the pelvis, againſt one of the iſchia, at its lower extremity; the forehead, being at the upper part of the oppoſite iſchium, is forced into the hollow of the under part of the ſacrum, while the vertex and hindhead is preſſed below the os pubis, (ſee Plate, CXI. fig. 7.) from whence it riſes in a quarter turn, gradually opening the os externum: the frænum labiorum, or fourchette, perinæum, fundament, and the parts that intervene betwixt that and the extremity of the ſacrum, are all ſtretched outwards in form of a large tumour. The perinæum, which is commonly but one inch from the os externum to the anus, is now ſtretched to three, the anus to two, and the parts between that and the coccyx are ſtretched from two inches to about three or more. The broad ſacroſciatic ligaments reaching from each ſide of the lower part of the ſacrum, to the under part of each iſchium, are alſo outwardly extended, and the coccyx is forced backward; while the crown of the head, where the lambdoidal croſſes the end of the ſagittal ſuture, continues to be puſhed along, and dilates the os externum more and more. See

Plate CXII. fig. 1. which is intended principally to ſhew in what manner the perinæum and external parts are ſtretched by the head of the fœtus, in a firſt pregnancy, towards the end of labour.

A, The abdomen.
B, The labia pudendi.
C, The clitoris and its præputium.
D, The hairy ſcalp of the fœtus ſwelled at the vertex, in a laborious caſe, and protrudedto the os externum.
EF, The perinæum and anus puſhed out by the head of the fœtus in form of a large tumour.
GG, The parts that cover the tuberoſities of hte oſſa iſchium.
H, The part that covers the os coccygis.

When the head is ſo far advanced, that the back part of the neck is come below the under part of the os pubis, the forehead forces the coccyx, fundament, and perinæum, backwards and downwards; then the hindhead riſes about two or three inches from under the pubes, making a half round turn in its aſcent, by which the forehead is equally raiſed from the parts upon which it preſſed, and the perinæum eſcapes without being ſplit or torn: at the ſame time, the ſhoulders advance into the ſides of the pelvis at its brim, where it is wideſt, and, with the body, are forced along and delivered: mean while, by the contraction of the uterus, the placenta and chorion are looſed from the inner ſurface to which they adhered, and forced through the vagina, out at the os externum.

When the head reſts at firſt above the brim of the pelvis, and is not far advanced, the fontanelle may be plainly felt with the finger, commonly towards the ſide of the pelvis: this is the place where the coronal croſſes the ſagittal ſuture, and the bones are a little ſeparated from each other, yielding a ſoftneſs to the touch, by which may be diſtinguiſhed four ſutures, or rather one croſſing another. Theſe may be plainly perceived, even before the membranes are broke; yet the examination muſt not be made during a pain, when the membranes are ſtretched down and filled with waters; but only when the pain begins to remit, and the membranes to be relaxed; otherwiſe they may be broke too ſoon, before the os internum be ſufficiently dilated, and the head properly advanced.

When the vertex is come lower down, the ſagittal ſuture only is to be felt; becauſe, as the hindhead deſcends in the pelvis, the fontanelle is turned more backwards, to the ſide, or towards the concavity of the ſacrum: but, after it has arrived below the under part of the oſſa pubis, the lambdoidal may be felt croſſing the end of the ſagittal ſuture, the occiput making a more obtuſe angle than that of the parietal bones, at the place where the three are joined together. But all theſe circumſtances are more eaſily diſtinguiſhed after the membranes are broke, or when the head is ſo compreſſed that the bones ride over one another, provided the hairy ſcalp be not exceſſively ſwelled. See Plate CXI. fig. 7.——See alſo

Plate CXII. fig. 2. which ſhews in what manner the head of the fœtus is helped along with the forceps, as artificial hands, when it is neceſſary for the ſafety of either mother or child.

AABC, The vertebræ of the loins, os ſacrum, and coccyx.
D, The os pubis of the left ſide.
E, The remaining part of the bladder.
FF, The inteſtinum rectum.
GGG, The uterus.
H, The mons veneris.
I, The clitoris, with the left nympha.
H, The corpus cavernoſum clitoridis.
V, The meatus urinarius.
K, The left labium pudendi.
L, The anus.
N, The perinæum.
QP, The left hip and thigh.
R, The ſkin and muſcular parts of the loins.

How and when to break the MEMBRANES.

IF the child be ſurrounded with a large quantity of waters, the uterus cannot come in contact with the body ſo as to preſs down the head, until the membranes are puſhed a conſiderable way before it into the vagina; nor even then, until they are broke, and the fluid diminiſhed in ſuch a manner as will allow the womb to contract, and, with the aſſiſtance of the pains, force along the child. When the membranes therefore are ſtrong or unadvanced, and continue ſo long unbroke that the delivery is retarded, provided the os internum be ſufficiently dilated, they ought to be broke without further delay; eſpecially if the woman hath been much fatigued or exhauſted with labour, or is ſeized with a violent flooding: in which caſe, the rupture of the membranes haſtens delivery, and the hæmorrhage is diminiſhed by the contraction of the uterus, which

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which leſſens the mouths of the veſſels that are alſo compreſſed by the body of the child.

The common method of breaking the membranes is by thruſting the finger againſt them when they are protruded with the waters during the pain, or by pinching them with the finger and thumb; but if they are detained too high to be managed in either of theſe methods, the hand may be introduced into the vagina, if the os externum is ſo lax as to admit it eaſily: and if this cannot be done without giving much pain, the fore and middle fingers being puſhed into the vagina with the other hand, let a probe or pair of pointed ſciſſars be directed along and between them, and thruſt through the membranes, when they are puſhed with the waters below the head. This operation muſt be cautiouſly performed, leſt the head ſhould be wounded in the attempt; and as for the membranes, let the opening be never ſo ſmall, the waters are diſcharged with force ſufficient to tear them aſunder.

If the vertex, inſtead of reſting at the ſide of the brim of the pelvis, or at the os pubis, is forced further down to the os internum, and the waters happen to be in ſmall quantity, the head is puſhed forwards, and gradually opens the mouth of the womb without any ſenſible interpoſition of the waters: then it advances by degrees into the vagina, and the membranes being ſplit or tore, little or nothing is diſcharged until the body of the child be delivered: and in this caſe, the hair of the head being plainly felt, will be a ſufficient indication that the membranes are broke. If no hair is to be felt, but a ſmooth body preſents itſelf to the touch; and the woman has undergone many ſtrong pains, even after the mouth of the womb hath been largely dilated, and the head forced into the middle of the pelvis; you may conclude, that delivery is retarded by the rigidity of the membranes; that there is but a ſmall quantity of waters; and that, if the containing ſacs were broke, the head would come along without further heſitation.

Sometimes, no waters can be felt while the head is no farther advanced than the upper part of the pelvis, becauſe it plugs up the paſſage and keeps them from deſcending; but, as it advances downwards, the uterus contracts, and they are forced down in a ſmall quantity towards the back part: from thence, as the head deſcends, or even though it ſhould ſtick in that ſituation, they are puſhed farther down, and the membranes may be eaſily broke; but the taſk is more difficult when no waters come down, and the membranes are contiguous to the head. In this caſe, they muſt be ſcratched a little during every pain, with the nail of a finger, which, though ſhort and ſmooth, will, by degrees, wear them thinner and thinner, until they ſplit upon the head by the force of labour. Yet this expedient ought never to be uſed until you are certain that delivery is retarded by their rigidity; for, if that be not the hindrance, the difficulty muſt proceed from the weakneſs of the woman, a large head, or narrow pelvis: in which caſe, the delivery is a work of time, and will be obſtructed by the premature diſcharge of the waters, which by gradually paſſing by the head, ought to keep the parts moiſt and ſlippery, in order to facilitate the birth: for when the membranes are not broke until the head is forced into the middle of the pelvis, the largeſt part of it being then paſt the upper part of the ſacrum, is commonly ſqueezed along, opens the os externum, and is delivered before all the waters are diſcharged from the uterus; ſo that what remains, by moiſtening and lubricating the parts, help the ſhoulders and body to paſs with more eaſe. When the membranes are too ſoon broke, the under part of the uterus contracts ſometimes ſo ſtrongly before the ſhoulders, that it makes the reſiſtance ſtill greater.

In moſt natural labours, the ſpace betwixt the fore and back fontanelles, viz. the vertex, preſents to the os internum, and the forehead is turned to the ſide of the pelvis; becauſe the baſin at the brim is wideſt from ſide to ſide; and frequently, before the head is puſhed in and faſt wedged among the bones, the child (after a pain) is felt to move and turn it to that ſide or ſituation in which it is leaſt preſſed and hurt, if it was not preſenting in that poſition before: but this poſition of the head may alter, viz. in thoſe where it is as wide, or wider, from the back part to the fore part of the brim, than from ſide to ſide, the forehead may be turned backwards or forwards. But this form of the pelvis ſeldom happens.

This poſture is always obſerved in a narrow pelvis, when the upper part of the ſacrum jets forward to the pubes; but, as the child is forced lower down, the forehead turns into the hollow at the inferior part of the ſacrum, becauſe the vertex and occiput find leſs reſiſtance at the lower part of the oſſa pubis than at the iſchium, to which it was before turned; the pelvis being at the pubes, as formerly deſcribed, no more than two inches in depth, whereas at the iſchium it amounts to four. If, therefore, the forehead ſticks in its former ſituation, without turning into the hollow, it may be aſſiſted by introducing ſome fingers, or the whole hand, into the vagina, during a pain, and moving it in the right poſition.

When the head of the fœtus preſents, and is forced along in any of thoſe poſitions, the labour is accounted natural; and little elſe is to be done, but to encourage the woman to bear down with all her ſtrength in every pain, and to reſt quietly during each interval: if the parts are rigid, dry, or inflamed, they ought to be lubricated with pomatum, hog's lard, butter, or *ung. althææ*: the two firſt are moſt proper for the external parts; and the two laſt (as being harder and not ſo eaſily melted) ought to be put up into the vagina, to lubricate that and the os internum.

The mouth of the womb and os externum, for the moſt part, open with greater difficulty in the firſt than in the ſucceeding labours, more eſpecially in women turned of thirty. In theſe caſes, the os externum muſt be gradually dilated in every pain, by introducing the fingers in form of a cone, and turning them round, ſo as to ſtretch the parts by gentle degrees; and the whole hand being admitted into the vagina, it will be ſometimes found neceſſary to inſinuate the fingers with the flat of the hand between the head and os internum: for, when this precaution is not taken in time, the os uteri is frequently puſhed before the head (eſpecially that part of it next the pubes) even through the os externum; or if the head paſſes the mouth of the womb, it will protrude the parts at the os externum, and will endanger a laceration in the perinæum.

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perinæum. This dilatation, however, ought to be cautiously performed, and never attempted except when it is abſolutely neceſſary; even then it muſt be effected ſlowly, and in time of a pain, when the woman is leaſt ſenſible of the dilating force.

When the labour happens to be lingering, though every thing be in a right poſture, if the aſſiſtants are clamorous, and the woman herſelf too anxious and impatient to wait the requiſite time without complaining, the labour will be actually retarded by her uneaſineſs, which we muſt endeavour to ſurmount by arguments and gentle perſuaſion; but if ſhe is not to be ſatisfied, and ſtrongly impreſſed with an opinion that certain medicines might be adminiſtered to haſten delivery, it will be convenient to preſcribe ſome innocent medicine, that ſhe may take between whiles, to beguile the time and pleaſe her imagination: but, if ſhe is actually weak and exhauſted, it will be neceſſary to order ſomething that will quicken the circulating fluids, ſuch as preparations of amber, caſtor, myrrh, volatile ſpirits, the *pulv. myrrh. compoſit.* of the *London*, or *pulv. ad partum* of the *Edinburgh Pharmacopœia*, with every thing in point of diet and drink that nouriſhes and ſtrengthens the body. If the patient is of a plethoric habit, with a quick ſtrong pulſe, the contrary method is to be uſed, ſuch as venæſection, antiphlogiſtic medicines, and plentiful draughts of weak diluting fluids.

How to behave when the birth is obſtructed by the navel-ſtring or ſhoulders of the child, or a narrow pelvis.

ALTHOUGH the head is puſhed down into the pelvis, and the vertex employed in opening the os externum, the forehead being lodged in the concavity formed by the coccyx and lower part of the ſacrum; yet frequently after the labour-pain is abated, the head again is withdrawn by the navel-ſtring happening to be twiſted round the neck; or when the ſhoulders, inſtead of advancing, are retarded at the brim of the pelvis, one reſting over the oſſa pubis, while the other is fixed at the ſacrum; or when (the waters having been long evacuated) the under-part of the uterus contracts round the neck and before the ſhoulders, keeping up the body of the child.

When the head is therefore drawn back by any of theſe obſtacles, and the delivery hath been retarded during ſeveral pains, one or two fingers being introduced into the rectum before the pain goes off, ought to preſs upon the forehead of the child at the root of the noſe, great care being taken to avoid the eyes: this preſſure detains the head till the return of another pain, which will ſqueeze it farther down, while the fingers puſhing ſlowly and gradually, turn the forehead half round outwards and half round upwards. By this aſſiſtance, and the help of ſtrong pains, the child will be forced along, although the neck be entangled in the navel-ſtring; for, as the child advances, the uterus contracts, and conſequently the placenta is moved lower: the funis umbilicalis will alſo ſtretch a little, without obſtructing the circulation.

The head being thus kept down, the ſhoulders too are preſſed in every ſucceeding pain until they are forced into the pelvis, when the whole comes along without further difficulty. And this expedient will, moreover, anſwer the purpoſe, when the under-part of the uterus or os internum is contracted round the neck of the child, and before the ſhoulders; alſo, when the head is very low, preſſing a finger on each ſide of the coccyx externally will frequently aſſiſt in the ſame manner; alſo in lingering caſes, when the woman is weak, the head large, or the pelvis narrow, you may aſſiſt the delivery by gently ſtretching both the os externum and internum with your fingers, in time of the pains, which will increaſe the ſame, as well as dilate; but this is only to be done when abſolutely neceſſary, and with caution, and at intervals, for fear of inflaming or lacerating the parts.

Over and above theſe obſtacles, the head may be actually delivered and the body retained by the contraction of the os externum round the neck, even after the face appears externally. In this caſe it was generally alledged that the neck was cloſe embraced by the os internum; but this ſeldom happens when the head is delivered, becauſe then the os internum is kept dilated on the back part and ſides by the breaſt and arms of the fœtus, unleſs it be forced low down with or before the head.

When the head is delivered and the reſt of the body retained from the largeneſs or wrong preſenting of the ſhoulders, or by the navel ſtring's being twiſted round the body or neck of the child, the head muſt be graſped on each ſide, the thumbs being applied to the occiput, the fore and middle fingers extended along each ſide of the neck, while the third and fourth of each hand ſupſupport each ſide of the upper jaw: thus embraced, the head muſt be pulled ſtreight forwards; and if it will not move eaſily along, the force muſt be increaſed, and the directions varied from ſide to ſide, or rather from ſhoulder to ſhoulder, not by ſudden jerks, but with a ſlow, firm, and equal motion. If the body cannot be moved in this manner, though you have exerted as much force as poſſible without running the riſk of over-ſtraining the neck, you muſt endeavour to ſlip the turns of the navel-ſtring over the head: but ſhould this be found impracticable, you ought not to trifle in tying the ſtring at two places, and cutting betwixt the ligatures, as ſome people have adviſed: ſuch an operation would engroſs too much time; beſides, the child is in no danger of ſuffocating from the ſtricture of the funis, becauſe it ſeldom or never breaths before the breaſt is delivered.

The better method is, immediately to ſlide along one or two fingers, either above or below, to one of the arm-pits; by which you try to bring along the body, while, with the other hand, you pull the neck at the ſame time: if it ſtill continues unmoved, ſhift hands, and let the other arm-pit ſuſtain the force; but, if this fail, cut the navel-ſtring, and tie it afterwards. If the ſhoulders lie ſo high that the fingers cannot reach far enough to cut or take ſufficient hold, let the flat of the hand be run along the back of the child: or ſhould the os externum be ſtrongly contracted round the neck, puſh up your hand along the breaſt, and pull as before: and ſhould this method fail, you muſt have recourſe to the blunt hook introduced and fixed in the arm pit; but this expedient muſt be uſed with caution, leſt the child ſhould be injured, or the parts lacerated.

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The child being born, the funis umbilicalis muſt be divided, and the placenta delivered, according to the directions that will occur in the ſequel.

How to manage the CHILD *after* DELIVERY.

THE child being delivered, ought to be kept warm beneath the bed-cloaths, or immediately covered with a warmed flanel or linen cloth: if it cries and breathes, the umbilical cord may be tied and cut, and the child delivered to the nurſe without delay; but, if the air does not immediately ruſh into the lungs, and the circulation continues between it and the placenta, the operation of tying and cutting muſt be delayed, and every thing tried to ſtimulate, and ſometimes to give pain. If the circulation is languid, reſpiration begins with difficulty, and proceeds with long intervals; and if it be entirely ſtopped in the funis; the child, if alive, is not eaſily recovered; ſometimes, a great many minutes are elapſed before it begins to breathe. Whatever augments the circulating force, promotes reſpiration; and as this increaſes, the circulation grows ſtronger, ſo that they mutually aſſiſt each other. In order to promote the one and the other, the child is kept warm, moved, ſhaken, whipt; the head, temples, and breaſt rubbed with ſpirits, garlick, onion, or muſtard applied to the mouth and noſe; and the child has been ſometimes recovered by blowing into the mouth with a ſilver canula, ſo as to expand the lungs.

When the placenta is itſelf delivered, immediately or ſoon after the child, by the continuance of the labour-pains, or hath been extracted by the operator, that the uterus may contract, ſo as to reſtrain too great a flooding; in this caſe, if the child has not yet breathed, and a pulſation is felt in the veſſels, ſome people (with good reaſon) order the placenta, and as much as poſſible of the navel-ſtring, to be thrown into a baſon of warm wine or water, in order to promote the circulation between them and the child; others adviſe us to lay the placenta on the child's belly, covered with a warm cloth; and a third ſet order it to be thrown upon hot aſhes: but, of theſe, the warm water ſeems the moſt innocent and effectual expedient. Nevertheleſs, if the placenta is ſtill retained in the uterus, and no dangerous flooding enſues, it cannot be in a place of more equal warmth, while the operator endeavours, by the methods above deſcribed, to bring the child to life.

In lingering labours, when the head of the child hath been long lodged in the pelvis, ſo that the bones ride over one another, and the ſhape is preternaturally lengthened, the brain is frequently ſo much compreſſed, that violent convulſions enſue before or ſoon after the delivery, to the danger and oft-times the deſtruction of the child. This diſorder is frequently relieved and carried off, and the bad conſequences of the long compreſſion prevented, by cutting the navel-ſtring before the ligature is made, or tying it ſo ſlighty as to allow two, three, or four large ſpoonfuls to be diſcharged.

If the child has been dead one or two days before delivery, the lips and genitals (eſpecially the ſcrotum in boys) are of a livid hue; if it hath lain dead in the uterus two or three days longer, the ſkin may be eaſily ſtript from every part of the body, and the navel-ſtring appears of the ſame colour with the lips and genitals: in ten or fourteen days, the body is much more livid and mortified, and the hairy ſcalp may be ſeparated with eaſe; and indeed, any part of the child which hath been ſtrongly preſſed into the pelvis, and retained in that ſituation for any length of time, will adopt the ſame mortified appearance.

How to tie the FUNIS UMBILICALIS.

DIFFERENT practitioners have uſed different methods of performing this operation: ſome propoſing to tie and ſeparate the funis before the placenta is delivered; to apply one ligature cloſe to the belly of the child, with a view to prevent a rupture of the navel; and making another two inches above the former, to divide the rope between the two tyings: by the ſecond ligature, they mean to prevent a dangerous hæmorrhage from the woman, provided the placenta adheres to the uterus. But all theſe precautions are founded upon miſtaken notions, and the following ſeems to be that which is eaſieſt and beſt: If the placenta is not immediately delivered by the pains, and no flooding obliges you to haſten the extraction, the woman may be allowed to reſt a little, and the child to recover; if it does not breathe, or the reſpiration is weak, let the methods above preſcribed be put in practice, with a view to ſtimulate the circulation; but if the child is lively, and cries with vigour, the funis may be immediately tied in this manner: having provided a ligature or two, compoſed of ſundry threads waxed together, ſo as to equal the diameter of a pack-thread, being ſeven inches in length, and knotted at each end, tie the navel-ſtring about two fingers breadth from the belly of the child, by making at firſt one turn, if the funis be ſmall, and ſecuring it with two knots; but if the cord be thick, make two more turns, and another double knot; then cut the funis with a pair of ſharp ſciſſars one finger's breath from the ligature towards the placenta; and in cutting run the ſciſſars as near as poſſible to the root of the blades, elſe the funis will be apt to ſlip from the edge, and you will be obliged to make ſeveral ſnips before you can effect a ſeparation: at the ſame time, guard the points of the ſciſſars with your other hand. The child being waſhed, a linen rag is wrapped round the tied funis; which being doubled up along the belly, a ſquare compreſs is laid over it, and kept firm or moderately tight with what the nurſes call a belly-band, or roller round the body.

This portion of the funis ſoon ſhrinks, turns firſt livid, then black, and about the fifth day falls off cloſe to the belly; and let the navel-ſtring be tied in any part, or at any diſtance whatſoever from the belly, it will always drop off at the ſame place: ſo that ruptures in the navel ſeldom or never depend upon the tying of the funis, but may happen when the compreſs and belly band are not kept ſufficiently firm, and continued ſome time after the ſeparation of the withered portion, eſpecially in thoſe children that cry much: the bandage ought always to be applied ſo ſlight as not to affect reſpiration.

The ligature upon the funis muſt always be drawn ſo tight as to ſhut up the mouths of the veſſels: therefore, if they continue to pour out their contents, another ligature muſt be applied below the former; for if this precaution

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caution be neglected, the child will ſoon bleed to death: yet, if the navel-ſtring is cut or tore aſunder at two or three hand-breadths from the belly, and expoſed to the cold without any ligature, the arteries will contract themſelves, ſo as that little or no blood ſhall be loſt; nay, ſometimes, if the funis hath been tied and cut at the diſtance of three finger-breadths from the child's belly, ſo as that it hath been kept from blooding for an hour or two, although the ligature be then untied, and the navel-ſtring and belly chafed, and ſoaked in warm water, no more blood will be diſcharged.

Of delivering the PLACENTA.

THE funis being ſeparated, and the child committed to the nurſe, the next care is to deliver the placenta and membranes, if they are not already forced down by the labour-pains. We have already obſerved, that if there is no danger from a flooding, the woman may be allowed to reſt a little, in order to recover from the fatigue ſhe has undergone; and that the uterus may, in contracting, have time to ſqueeze and ſeparate the placenta from its inner ſurface: during which pauſe alſo, about one, two or three tea-cups full of blood is diſcharged through the funis, from the veſſels of the placenta, which is thus diminiſhed in bulk, ſo that the womb may be the more contracted; and this is the reaſon for applying one ligature only upon the cord. In order to deliver the placenta, take hold of the navel-ſtring with the left hand, turning it round the fore and middle fingers, or wrapping it in a cloth, that it may not ſlip from your graſp; then pull gently from ſide to ſide, and deſire the woman to aſſiſt your endeavour, by ſtraining as if ſhe were at ſtool, blowing forcibly into her hand, or provoking herſelf to reach by thruſting her finger into her throat. If by theſe methods the placenta cannot be brought away, introduce your hand ſlowly into the vagina, and feel for the edge of the cake; which when you have found, pull it gradually along; as it comes out at the os externum, take hold of it with both hands and deliver it, bringing away, at the ſame time, all the membranes, which, if they adhere, muſt be pulled along with leiſure and caution.

When the funis takes its origin towards the edge of the placenta, which is frequently the caſe, the cake comes eaſier off by pulling, than when the navel-ſtring is inſerted in the middle, unleſs it be uncommonly retained by its adheſion to the womb, or by the ſtrong contraction of the os internum. If the funis is attached to the middle of the placenta, and that part preſents to the os internum or externum, the whole maſs will be too bulky to come along in that poſition: in this caſe you muſt introduce two fingers within the os externum, and bring it down with its edge foremoſt.

When the placenta is ſeparated by the contraction of the uterus, in conſequence of its weight and bulk, it is puſhed down before the membranes, and both are brought away inverted.

When part of the placenta hath paſſed the os internum, and the reſt of it cannot be brought along by eaſy pulling, becauſe the os uteri is cloſe contracted round the middle of it, or part of it ſtill adheres to the womb, ſlide the flat of your hand below the placenta through the os internum; and having dilated the uterus, ſlip down your hand to the edge of the cake, and bring it along: but, if it adheres to the uterus, puſh up your hand again, and having ſeparated it cautiouſly, deliver it as before.

If, inſtead of finding the edge or middle of the placenta preſenting to the os externum or internum, you feel the mouth of the womb cloſely contracted, you muſt take hold of the navel-ſtring as above directed, and ſlide your other hand along the funis into the vagina; then ſlowly puſh your fingers and thumb, joined in form of a cone, through the os uteri, along the ſame cord, to the place of its inſertion in the placenta: here let your hand reſt, and feel with your fingers to what part of the uterus the cake adheres: if it be looſe at the lower edge, try to bring it along; but if it adheres, begin and ſeparate it ſlowly, the back of your hand being turned to the uterus, and the fore-part of your fingers towards the placenta: and for this operation the nails ought to be cut ſhort and ſmooth. In ſeparating, preſs the ends of your fingers more againſt the placenta than the uterus; and if you cannot diſtinguiſh which is which, becauſe both feel ſoft (though the uterus is firmer than the placenta, and this laſt more ſolid than coagulated blood;) in this caſe, ſlide down your fingers to its edge, and conduct them by the ſeparated part, preſſing it gently from the uterus, until the whole is diſengaged. Sometimes, when part of it is ſeparated, the reſt will looſen and come along, if you pull gently at the detached portion; but, if this is not effected with eaſe, let the whole of it be ſeparated in the moſt cautious manner: ſometimes, alſo, by graſping the inſide of the placenta with your hand, the whole will be looſened without further trouble. As the placenta comes along, ſlide down your hand and take hold of the lower edge, by which it muſt be extracted, becauſe it is too bulky to be brought away altogether in a heap; and let it be delivered as whole as poſſible, keeping your thumb or fingers fixed upon the navel-ſtring, by which means laceration is often prevented.

When the woman lies on her back, and the placenta adheres to the left ſide of the uterus, it will be moſt commodious to ſeparate the cake with the right hand; whereas the left hand is moſt conveniently uſed when the placenta adheres to the right ſide of the womb; but when it is attached to the forepart, back, or fundus, either hand will anſwer the purpoſe.

That part of the uterus to which the placenta adheres, is kept ſtill diſtended, while all the reſt of it is contracted.

The nearer the adheſion is to the os internum, the eaſier is the placenta ſeparated, and *vice verſa*; becauſe it is difficult to reach up to the fundus, on account of the contraction of the os internum, and lower part of the womb, which are not ſtretched again without great force after they have been contracted for any length of time.

When therefore the placenta adheres to the fundus, and all the lower part of the womb is ſtrongly contracted, the hand muſt be forced up in form of a cone into the vagina, and then gradually dilate the os internum and inferior part of the uterus. If great force is required, exert it ſlowly, reſting between whiles, that the hand may not be

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be cramped, nor the vagina in danger of being tore from the womb; for in this caſe, the vagina will lengthen conſiderably upwards.

While you are thus employed, let an aſſiſtant preſs with both hands on the woman's belly; or while you puſh with one hand, preſs with the other, in order to keep down the uterus, elſe it will riſe high up, and roll about like a large ball, below the lax parietes of the abdomen, ſo as to hinder you from effecting the neceſſary dilatation.

When you have overcome this contraction, and introduced your hand into the fundus, ſeparate and bring the placenta along, as above directed; and ſhould the uterus be contracted in the middle like an hour-glaſs, a circumſtance that ſometimes, though rarely happens, the ſame method muſt be practiſed.

In every caſe, and eſpecially when the placenta hath been delivered with difficulty, introduce your your hand after its extraction, in order to examine if any part of the uterus be pulled down and inverted; and if that be the caſe, puſh it up and reduce it without loſs of time, then clear it of the coagulated blood, which otherwiſe may occaſion violent after-pains.

For the moſt part, in ten, fifteen, or twenty minutes, more or leſs, the placenta will come away of itſelf; and though ſome portion of it, or of the membranes, be left in the uterus, provided no great flooding enſues, it is commonly diſcharged in a day or two, without any detriment to the woman: but at any rate, if poſſible, all the ſecundines ought to be extracted at once, and before you leave your patient, in order to avoid reflections.

Of LABORIOUS LABOURS.

How Laborious Labours *are occaſioned.*

All thoſe caſes in which the head preſents, and cannot be delivered in the natural way, are accounted more or leſs laborious, according to the different circumſtances from which the difficulty ariſes: and theſe commonly are, firſt, Great weakneſs, proceeding from loſs of appetite and bad digeſtion; frequent vomitings, diarrhœas, or dyſenteries, floodings, or any other diſeaſe that may exhauſt the patient; as alſo the fatigue ſhe may have undergone by unſkilful treatment in the beginning of labour.

Secondly, From exceſſive grief and anxiety of mind, occaſioned by the unſeaſonable news of ſudden misfortune in time of labour; which often affect her ſo, as to carry off the pains, and endanger her ſinking under the ſhock.

Thirdly, From the rigidity of the os uteri, vagina, and external parts, which commonly happens to women in the firſt birth, eſpecially to thoſe who are about the age of forty: though it may be alſo owing to large calloſities, produced from laceration or ulceration of the parts; or to glands and ſchirrous tumours that block up the vagina.

Fourthly, When the under-part of the uterus is contracted before the ſhoulders, or the body entangled in the navel-ſtring.

Fifthly, From the wrong preſentation of the child's head; that is, when the forehead is towards the groin or middle of the os pubis; when the face preſents with the chin to the os pubis, iſchium, or ſacrum; when the crown of the head reſts above the os pubis, and the forehead or face is preſſed into the hollow of the ſacrum; and laſtly, when one of the ears preſents.

Sixthly, From the extraordinary oſſification of the child's head, by which the bones of the ſkull are hindered from yielding, as they are forced into the pelvis; and form a hydrocephalus or dropſy, diſtending the head to ſuch a degree, that it cannot paſs along until the water is diſcharged.

Seventhly, From a too ſmall or diſtorted pelvis, which often occurs in very little women, or ſuch as have been ricketty in their childhood. See Plate CXII. fig. 6. 7.

In all theſe caſes, except when the pelvis is too narrow and the head too large, provided the head lies at the upper-part of the brim, or (though preſſed into the pelvis) can be eaſily puſhed back into the uterus, the beſt method is, to turn the child and deliver by the feet; but, if the head is preſſed into the middle or lower part of the pelvis, and the uterus ſtrongly contracted round the child, delivery ought to be performed with the forceps; and in all the ſeven caſes, if the woman is in danger, and if you can neither turn, nor deliver with the forceps, the head muſt be opened and delivered with crotchets. Laborious caſes, from ſome of the above-recited cauſes, happen much oftener than thoſe we call preternatural; but, thoſe which proceed from a narrow pelvis, or a large head, are of the worſt conſequence. Theſe caſes demand greater judgment in the operator than thoſe in which the child's head does not preſent; becauſe in theſe laſt we know, that the beſt and ſafeſt method is to deliver by the feet; whereas in laborious births, we muſt maturely conſider the cauſe that retards the head from coming along, together with the neceſſary aſſiſtance required; we muſt determine when we ought to wait patiently for the efforts of nature, and when it is abſolutely neceſſary to come to her aid. If we attempt to ſuccour her too ſoon, and uſe much force in the operation, ſo that the child and mother, or one of the two, are loſt, we will be apt to reproach ourſelves for having acted prematurely; upon the ſuppoſition, that if we had waited a little longer, the pains might have, by degrees, delivered the child; or at leaſt, forced the head ſo low, as that we might have extracted it with more ſafety, by the aſſiſtance of the forceps. On the other hand, when we leave it to nature, perhaps by the ſtrong preſſure upon the head and brain, the child is dead when delivered, and the woman ſo exhauſted with tedious labour, that her life is in imminent danger: in this caſe, we blame ourſelves for delaying our help ſo long, reflecting that had we delivered the patient ſooner, without paying ſuch ſcrupulous regard to the life of the child, the woman might have recovered without having run ſuch a dangerous riſk. Doubtleſs it is our duty to ſave both mother and child, if poſſible; but, if that is impracticable, to pay our chief regard to the parent; and in all dubious caſes, to act cautiouſly and circumſpectly, to the beſt of our judgment and ſkill.

If the head is advanced into the pelvis, and the uterus ſtrongly contracted round the child, great force is required to puſh it back into the womb, becauſe the effort muſt be ſufficient

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Plate CXIII

Fig. 1.

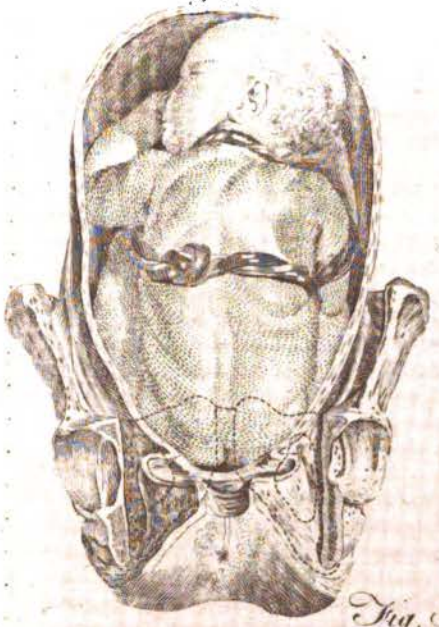

Fig. 2.

Fig. 6.

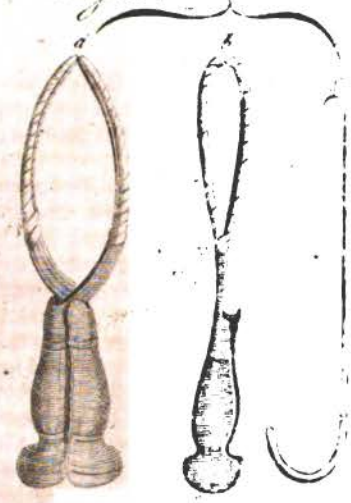

Fig. 3.

Fig. 7.

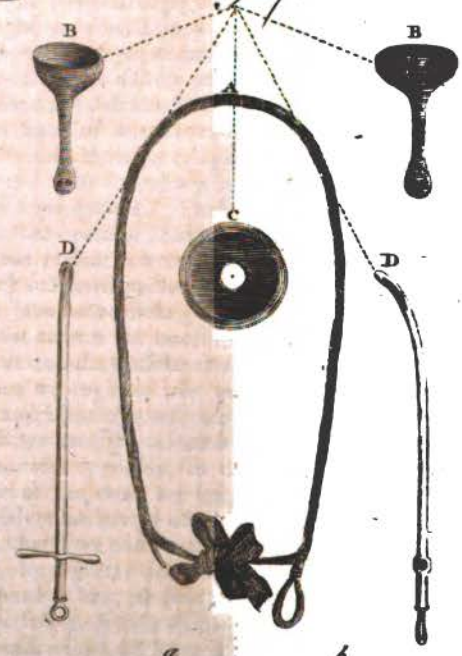

Fig. 4.

Fig. 5.

Fig. 8.

J. Bell. fc.

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ſufficient to ſtretch the uterus, ſo as to re-admit the head, together with your hand and arm; and even then the child will be turned with great difficulty.

Should you turn when the head is too large, you may bring down the body of the child, but the head will ſtick faſt above, and cannot be extracted without the help of forceps or crotchets; (ſee explanation of Plate CXIII. fig. 5. below:) yet the caſe is ſtill worſe in a narrow pelvis, even though the head be of an ordinary ſize. When things are ſo ſituated, you ſhould not attempt to turn, becauſe in ſo doing you may give the woman a great deal of pain, and yourſelf much unneceſſary fatigue: you ought therefore to try the forceps, and if they do not ſucceed, diminiſh the ſize of the head, and extract it, as ſhall be afterwards ſhewn.

Plate CXIII. fig. 5. repreſents, in a lateral view of the pelvis, the method of extracting, with the aſſiſtance of a curved crotchet, the head of the fœtus, when left in the uterus, after the body is delivered and ſeparated from it; either by its being too large, or the pelvis too narrow.

ABC, The os ſacrum and coccyx.
D, The os pelvis of the left ſide.
EE, The uterus.
F, The locking part of the crotchet.
g,h,i. The point of the crotchet on the inſide of the cranium.

Of the FILLETS *and* FORCEPS.

WE have already obſerved, that the greateſt number of difficult and lingering labours proceed from the head's ſticking faſt in the pelvis, which ſituation is occaſioned by one of the ſeven cauſes recited above: when formerly this was the caſe, the child was generally loſt, unleſs it could be turned and delivered by the feet; or if it could be extracted alive, either died ſoon after delivery, or recovered with great difficulty from the long and ſevere compreſſion of the head, while the life of the mother was endangered from the ſame cauſe as above deſcribed: for, the preſſure being reciprocal, the fibres and veſſels of the ſoft parts contained in the pelvis are bruiſed by the child's head, and the circulation of the fluids obſtructed; ſo that a violent inflammation, and ſometimes a ſudden mortification, enſues. If the child could not be turned, the method practiſed in theſe caſes, was to open the head and extract with the crotchet; and this expedient produced a general clamour among the women, who obſerved, that when recourſe was had to the aſſiſtance of a man-midwife, either the mother or child, or both, were loſt. This cenſure, which could not fail of being a great diſcouragement to male practitioners, ſtimulated the ingenuity of ſeveral gentlemen of the profeſſion, in order to contrive ſome gentler method of bringing along the head, ſo as to ſave the child, without any prejudice to the mother.

Their endeavours have not been without ſucceſs: a more ſafe and certain expedient for this purpoſe hath been invented, and of late brought to greater perfection in this than in any other kingdom; ſo that if we are called in before the child is dead, or the parts of the woman in danger of a mortification, both the fœtus and mother may frequently be happily ſaved. This fortunate contrivance is no other than the forceps, which was, as is alledged, firſt uſed here by the *Chamberlains*, by whom it was kept as a noſtrum, and after their deceaſe ſo imperfectly known, as to be ſeldom applied with ſucceſs: ſo that different practitioners had recourſe to different kinds of fillets or lacks. Blunt hooks alſo of various make were invented in *England*, *France*, and other parts. The forceps, ſince the time of Dr *Chamberlain*, have undergone ſeveral alterations, particularly in the joining, handles, form, and compoſition.

The common way of uſing them formerly, was by introducing each blade at random, taking hold of the head any how, pulling it ſtraight along, and delivering with downright force and violence; by which means, both os internum and externum were often tore, and the child's head much bruiſed. On account of theſe bad conſequences, they had been altogether diſuſed by many practitioners; ſome of whom endeavoured, in lieu of them, to introduce divers kinds of fillets over the child's head; but none of them can be ſo eaſily uſed, or have near ſo many advantages, as the forceps, when rightly applied and conducted.

For my own part, ſays Dr *Smellie*, finding in practice that, by the directions of *Chapman*, *Giffard*, and *Gregoire* at *Paris*, I frequently could not move the head along without contuſing it, and tearing the parts of the woman; for they direct us to introduce the blades of the forceps where they will eaſieſt paſs, and taking hold of the head in any part of it, to extract with more or leſs force, according to the reſiſtance; I began to conſider the whole in a mechanical view, and reduce the extraction of the child to the rules of moving bodies in different directions: in conſequence of this plan, I more accurately ſurveyed the dimenſions and form of the pelvis, together with the figure of the child's head, and the manner in which it paſſed along in natural labours: and from the knowledge of theſe things, I not only delivered with greater eaſe and ſafety than before, but alſo had the ſatisfaction to find in teaching, that I could convey a more diſtinct idea of the art in this mechanical light than in any other; and particularly, give more ſure and ſolid directions for applying the forceps, even to the conviction of many old practitioners, when they reflected on the uncertainty attending the old method of application. From this knowledge, too, joined with experience, and hints which have occurred and been communicated to me, I have been led to alter the form and dimenſions of the forceps, ſo as to avoid the inconveniencies that attended the uſe of the former kinds. See Plate CXIII. fig. 6.

A, The ſtreight forceps, in the exact proportion as to the width between the blades, and length from the points to the locking part; the firſt being two and the ſecond ſix inches, which, with three inches and a half, (the length of the handles), make in all eleven inches and a half.

B repreſents the poſterior part of a ſingle blade, in order to ſhew the width and length of the open part of the ſame, and the form and dimenſions of the whole.

C, The blunt hook, which is uſed for three purpoſes: 1. To aſſiſt the extraction of the head, after the cranium is opened with the ſciſſars, by introducing

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the ſmall end along the ear on the outſide of the head to above the under-jaw, where the point is to be fixed; the other extremity of the hook being held with one hand, whilſt two fingers of the other are to be introduced into the foreſaid opening, by which holds the head is to be gradually extracted. 2. The ſmall end is uſeful in abortions, in any of the firſt four or five months, to hook down the ſecundines, when lying looſe in the uterus, when they cannot be extracted by the fingers, or labour-pains, and when the patient is much weakened by floodings. 3. The large hook at the other end is uſeful to aſſiſt the extraction of the body, when the breech preſents; but ſhould be uſed with great caution, to avoid the diſlocation or fracture of the thigh.

The lacks or fillets are of different kinds, of which the moſt ſimple is a nooſe made on the end of a fillet or limber garter: but this can only be applied, before the head is faſt jammed in the pelvis, or when it can be puſhed up and raiſed above the brim. The os externum and internum having been gradually dilated, this nooſe muſt be conveyed on the ends of the fingers, and ſlipped over the fore and hind head. There are alſo other kinds differently introduced upon various blunt inſtruments, too tedious either to deſcribe or uſe: but the moſt uſeful of all theſe contrivances, is a fillet made in form of a ſheath, mounted upon a piece of ſlender whale-bone, about two feet in length, which is eaſier applied than any other expedient of the ſame kind. See Plate CXIII. fig. 7.

A repreſents the whale-bone fillet, which may be ſometimes uſeful in laborious caſes, when the operator is not provided with the forceps, in ſudden and unexpected exigencies.

BB, Two views of a peſſary for the prolapſus uteri. After the uterus is reduced, the large end of the peſſary is to be introduced into the vagina, and the os uteri retained in the concave part, where there are three holes to prevent the ſtagnation of any moiſture. The ſmall end without the os externum has two tapes drawn through the two holes, which are tied to four other tapes, that hang down from a belt that ſurrounds the woman's body, and by this means keep up the peſſary. This peſſary may be taken out by the patient when ſhe goes to bed, and introduced again in the morning; but as this ſometimes rubs the os externum, ſo as to make its uſe uneaſy, the round kind, marked C, are of more general uſe. They are made of wood, ivory, or cork, (the laſt covered with cloth and dipt in wax:) The peſſary is to be lubricated with pomatum, the edge forced through the paſſage into the vagina, and a finger introduced in the hole in the middle lays it a-croſs within the os externum. They ought to be larger or ſmaller, according to the wideneſs or narrowneſs of the paſſage, to prevent their being forced out by any extraordinary ſtraining.

DD gives two views of a female catheter, to ſhew its degree of curvature and different parts.

When the head is high up in the pelvis, if the woman has been long in labour, and the waters diſcharged for a conſiderable time, the uterus being ſtrongly contracted, ſo as that the head and ſhoulders cannot be raiſed, or the child turned to be delivered by the feet, while the mother is enfeebled, and the pains ſo weak, that, unleſs aſſiſted, ſhe is in danger of her life; alſo, when the os internum, vagina, and labia pudendi, are inflamed, and tumefied; or when there is a violent diſcharge of blood from the uterus, provided the pelvis is not too narrow, nor the head too large, this fillet may be ſucceſsfully uſed; in which caſe, if the os externum and internum are not already ſufficiently open, they muſt be gradually dilated as much as poſſible, by the hand, which at the ſame time muſt be introduced and paſſed along the ſide of the head, in order to aſcertain the poſition thereof. This being known, let the other hand introduce the double of the whale-bone and fillet over the face and chin, where you can have the beſt purchaſe, and where it will be leaſt apt to ſlip and loſe its hold. This application being effected, let the hand be brought down, and the whale-bone drawn from the ſheath of the fillet, which (after the ends of it are tied together) muſt be pulled during every pain, preſſing at the ſame time with the other hand, upon the oppoſite part of the head, and uſing more or leſs force according to the reſiſtance.

The diſadvantage attending all fillets, is the difficulty in introducing and fixing them: and though this laſt is eaſier applied than the others; yet when the vertex preſents, the child's chin is ſo preſſed to the breaſt, that it is often impracticable to inſinuate the fillet between them; and if it is fixed upon the face or hind head, it frequently ſlips off, in pulling: but, granting it commodiouſly fixed, when the head is large, or the pelvis narrow; ſo that we are obliged to pull with great force, the fillet will gall, and even cut the ſoft parts to the very bone; and if the child comes out of a ſudden, in conſequence of violent pulling, the external parts of the woman are in great danger of ſudden laceration: but, if the head is ſmall, and comes along with a moderate force, the child may be delivered by this contrivance, without any bad conſequence: though in this caſe, we find by experience, that unleſs the woman has ſome very dangerous ſymptom, the head will in time ſlide gradually down into the pelvis, even when it is too large to be extracted with the fillet or forceps, and the child be ſafely delivered by the labour-pains, although ſlow and lingering, and the mother ſeems weak and exhauſted, provided ſhe be ſupported with nouriſhing and ſtrengthening cordials.

As the head in the 6th and 7th caſes is forced along the pelvis, commonly in theſe laborious caſes, the bones of the cranium are ſo compreſſed, that they ride over one another, ſo that the bulk of the whole is diminiſhed, and the head, as it is puſhed forward, is, from a round, altered into an oblong figure: when therefore it is advanced into the pelvis, where it ſticks faſt for a conſiderable time, and cannot be delivered by the labour-pains, the forceps may be introduced with great eaſe and ſafety, like a pair of artificial hands, by which the head is very little (if at all) marked, and the woman very ſeldom tore. But if the head is detained above the brim of the pelvis, or a ſmall portion of it only farther advanced, and it appears, that the one being too narrow, or the other too large, the woman cannot be delivered by the ſtrongeſt labour-pains;

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in that caſe, the child cannot be ſaved either by turning and bringing it by the feet, or delivered by the application of fillet or forceps; but the operator muſt unavoidably uſe the diſagreeable method of extracting with the crotchet. Nevertheleſs, in all theſe caſes, the forceps ought firſt to be tried; and ſometimes they will ſucceed beyond expectation, provided the birth is retarded by the weakneſs of the woman, and the ſecond, third, fourth, or fifth obſtructions: but they cannot be depended upon even when the vertex preſents, with the forehead to the ſide or back part of the pelvis, and (though the woman has had ſtrong pains for many hours after the membranes are broke) the head is not forced down into the pelvis, or at leaſt, but an inconſiderable part of it, reſembling the ſmall end of a ſugar-loaf. For, from theſe circumſtances, you may conclude, that the largeſt part of it is ſtill above the brim, and that either the head is too large, or the pelvis too narrow. Even in theſe caſes, indeed, the laſt fillet or a long pair of forceps may take ſuch firm hold, that, with great force and the ſtrong purchaſe, the head will be delivered: but ſuch violence is commonly fatal to the woman, by cauſing ſuch an inflammation, and perhaps laceration of the parts, as is attended with mortification.

When the head is high, the forceps may be locked in the middle of the pelvis; but in that caſe, great care muſt be taken in feeling with the fingers all round, that no part of the vagina be included in the locking. Sometimes, when the head reſts, or is preſſed too much on the forepart or ſide of the pelvis, either at the brim or lower down, by introducing one blade, it may be moved farther down, provided the labour-pains are ſtrong, and the operation aſſiſted by the fingers of the other hand applied to the oppoſite ſide of the head; but if the fingers cannot reach high enough, the beſt method is to turn or move the blade towards the ear of the child, and introduce the other along the oppoſite ſide.

General rules for uſing the Forceps.

The farther the head is advanced in the pelvis, the eaſier it is delivered with the forceps; becauſe then, if in the 6th or 7th caſe, it is changed from a round to an oblong figure, by being forced along by the labour-pains: on the contrary, when the head remains high up, reſting upon the brim of the pelvis, the forceps are uſed with greater difficulty and uncertainty.

The os externum muſt be gradually opened by introducing the fingers one after another, in form of a cone, after they have been lubricated with pomatum, moving and turning them in a ſemicircular motion, as they are puſhed up. If the head is ſo low down that the hand cannot be introduced high up in this form, let the parts be dilated by the fingers turned in the direction of the coccyx, the back of the hand being upwards, next to the child's head: the external parts being ſufficiently opened to admit all the fingers, let the back of the hand be turned to the perinæum, while the fingers and thumb being flattened, will ſlide along betwixt the head and the os ſacrum. If the right hand be uſed, let it be turned a little to the left ſide of the pelvis, becauſe the broad ligament and membrane that fill up the ſpace between the ſacrum and iſchia, will yield and allow more room for the fingers to advance; for the ſame reaſon, when the left hand is introduced, it muſt be turned a little to the right ſide. Having gained your point ſo far, continue to puſh up, until your fingers paſs the os internum; at the ſame time, with the palm of your hand, raiſe or ſcoop up the head; by which means, you will be more at liberty to reach higher, dilate the internal parts, and diſtinguiſh the ſituation and ſize of the head, together with the dimenſions of the pelvis: from which inveſtigation, you will be able to judge, whether the child ought to be turned and brought by the feet, or delivered with the forceps; or, if the labour-pains are ſtrong, and the head preſents tolerably fair, without being jammed in the pelvis, you will reſolve to wait ſome time, in hope of ſeeing the child delivered by the labour-pains, eſpecially when the woman is in no immediate danger, and the chief obſtacle is the rigidity of the parts.

The poſition of the head is diſtinguiſhed by feeling for one of the ears, the fore or ſmooth part of which is towards the face of the child; if it cannot be aſcertained by this mark, the hand and fingers muſt be puſhed farther up, to feel for the face or back-part of the neck; but, if the head cannot be traced, the obſervation muſt be taken from the fontanelle, or that part of the cranium where the lambdoidal croſſes the end of the ſagittal ſuture. When the ears of the child are towards the ſides of the pelvis, or diagonal, the forehead being either to the ſacrum or pubes, the patient muſt lie on her back, with her breech a little over the bed. If one ear is to the ſacrum, and the other to the pubes, ſhe muſt be laid on one ſide, with her breech over the bed, as before, her knees being pulled up to her belly, and a pillow placed between them; except when the upper part of the ſacrum jets too much forward; in which caſe, ſhe muſt lie upon her back, as above deſcribed.

The blades of the forceps ought always, if poſſible, to be introduced along the ears; by which means, they approach nearer to each other, gain a firmer hold, and hurt the head leſs than in any other direction: frequently, indeed, not the leaſt mark of their application is to be perceived; whereas, if the blades are applied along the forehead and occiput, they are at a greater diſtance from each other, require more room, frequently at their points preſs in the bones of the ſkull, and endanger a laceration in the os externum of the woman. See Plate CXII. fig. 2.

The woman being laid in a right poſition for the application of the forceps, the blades ought to be privately conveyed between the feather-bed and the cloaths, at a ſmall diſtance from one another, or on each ſide of the patient: that this conveyance may be the more eaſily effected, the legs of the inſtrument ought to be kept in the operator's ſide-pockets. Thus provided, when he ſits down to deliver, let him ſpread the ſheet that hangs over the bed, upon his lap, and under that cover, take out and diſpoſe the blades on each ſide of the patient; by which means, he will often be able to deliver with the forceps, without their being perceived by the woman herſelf, or any other of the aſſiſtants. Some people pin a ſheet to each ſhoulder, and throw the other end over the bed,

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bed, that they may be the more effectually concealed from the view of thoſe who are preſent: but this method is apt to confine and embarraſs the operator. At any rate, as women are commonly frightened at the very name of an inſtrument, it is adviſeable to conceal them as much as poſſible, until the character of the operator is fully eſtabliſhed.

The different ways of uſing the Forceps.

When the Head is down to the Os Externum.

When the head preſents fair, with the forehead to the ſacrum, the occiput to the pubes, and the ears to the ſides of the pelvis, or a little diagonal; in this caſe, the head is commonly pretty well advanced in the baſon, and the operator ſeldom miſcarries in the uſe of the forceps. Things being thus ſituated, let the patient be laid on her back, her head and ſhoulders being ſomewhat raiſed, and the breech advanced a little over the ſide or foot of the bed; while the aſſiſtants ſitting on each ſide ſupport her legs, at the ſame time keeping her knees duly ſeparated and raiſed up to the belly, and her lower parts always covered with the bed cloaths, that ſhe may not be apt to catch cold. In order to avoid this inconvenience, if the bed is at a great diſtance from the fire, the weather cold, and the woman of a delicate conſtitution, a chafing-diſh with charcoal, or a veſſel with warm water, ſhould be placed near, or under the bed. Theſe precautions being taken, let the operator place himſelf upon a low chair, and having lubricated with pomatum the blades of the forceps, and alſo his right hand and fingers, ſlide firſt the hand gently into the vagina, puſhing it along in a flattened form, between that and the child's head, until the fingers have paſſed the os internum; then, with his other hand, let him take one of the blades of the forceps from the place where it was depoſited, and introduce it betwixt his right hand and the head; if the point or extremity of it ſhould ſtick at the ear, let it be ſlipt backward a little, and then guided forwards with a ſlow and delicate motion: when it ſhall have paſſed the os uteri, let it be advanced ſtill farther up, until the reſt at which the blades lock into each other be cloſe to the lower part of the head, or at leaſt within an inch thereof.

Having in this manner introduced one blade, let him withdraw his right hand, and inſinuate his left in the ſame direction, along the other ſide of the head, until his fingers ſhall have paſſed the os internum; then taking out the other blade from the place of concealment, with the hand that is diſengaged, let it be applied to the other ſide of the child's head, by the ſame means employed in introducing the firſt; then the left hand muſt be withdrawn, and the head being embraced between the blades, let them be locked in each other. Having thus ſecured them, he muſt take a firm hold with both hands, and, when the pain comes on, begin to pull the head along from ſide to ſide, continuing this operation during every pain until the vertex appears through the os externum, and the neck of the child can be felt with the finger below the os pubis; at which time, the forehead puſhes out the perinæum like a large tumour: then let him ſtand up, and raiſing the handles of the forceps, pull the head upwards alſo, that the forehead being turned half round upwards, the perinæum and lower parts of the os externum may not be tore.

In ſtretching the os externum or internum, we ought to imitate nature: for in practice we find, that when they are opened ſlowly, and at intervals, by the membranes with the waters, or the child's head, the parts are ſeldom inflamed or lacerated: but in all natural labours, when theſe parts are ſuddenly opened, and the child delivered by ſtrong and violent pains, without much intermiſſion, this misfortune ſometimes happens, and the woman is afterwards in great pain and danger.

We ought therefore, when obliged to dilate thoſe parts, to proceed in that ſlow, deliberate manner; and though upon the firſt trial, they feel ſo rigid, that one would imagine they could never yield or extend; yet, by ſtretching with the hand, and reſting by intervals, we can frequently overcome the greateſt reſiſtance. We muſt alſo, in ſuch caſes, be very cautious, pulling ſlowly, with intermiſſions, in order to prevent the ſame laceration: for which purpoſe too, we ought to lubricate the perinæum with pomatum, during thoſe ſhort intervals, and keep the palm of one hand cloſe preſſed to it and the neighbouring parts, while with the other we pull at the extremity of the handles of the forceps; by which means, we preſerve the parts, and know how much we may venture to pull at a time. When the head is almoſt delivered, the parts, thus ſtretched, muſt be ſlipped over the forehead and face of the child, while the operator pulls upwards with the other hand, turning the handles of the forceps to the abdomen of the woman.

This method of pulling upwards, raiſes the child's head from the perinæum, and the half-round turn to the abdomen of the mother brings out the forehead and face from below; for, when that part of the hind-head which is joined to the neck, reſts at the under-part of the os pubis, the head turns upon it, as upon an axis. In preternatural caſes alſo, the body being delivered, muſt in the ſame manner be raiſed up over the belly of the mother, and at the ſame time the perinæum ſlipt over the face and forehead of the child.

In the introduction of the forceps, let each blade be puſhed up in an imaginary line from the os externum, to the middle ſpace betwixt the navel and *ſcrobiculus cordis* of the woman; or, in other words, the handles of the forceps are to be held as far back as the perinæum will allow. The introduction of the other hand to the oppoſite ſide, will, by preſſing the child's head againſt the firſt blade, detain it in its proper place till the other can be applied; or, if this preſſure ſhould not ſeem ſufficient, it may be ſupported by the operator's knee.

When the head is come low down, and cannot be brought farther, becauſe one of the ſhoulders reſts above the os pubis, and the other upon the upper-part of the ſacrum, let the head be ſtrongly graſped with the forceps, and puſhed up as far as poſſible, moving from blade to blade as you puſh up, that the ſhoulders may be the more eaſily moved to the ſides of the pelvis, by turning the face or forehead a little towards one of them; then, the forehead muſt be brought back again into the hollow of the ſacrum, and another effort made to deliver: but, ſhould

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ſhould the difficulty remain, let the head be puſhed up again, and turned to the other ſide; becauſe it is uncertain which of the ſhoulders reſts on the os pubis, or ſacrum. Suppoſe, for example, the right ſhoulder of the child ſticks above the os pubis, the forehead being in the hollow of the ſacrum; in this caſe, if the forehead be turned to the right-hand ſide of the woman, the ſhoulder will not move; whereas, if it be turned to the left, and the head at the ſame time puſhed a little upwards, ſo as to raiſe and diſengage the parts that were fixed, the right ſhoulder being towards the right hand ſide, and the other to the left ſide of the brim of the pelvis, when the forehead is turned back again into the hollow of the ſacrum, the obſtacle will be removed, and the head be more eaſily delivered. This being performed, let the forceps be unlocked, and the blades diſpoſed cautiouſly under the cloaths ſo as not to be diſcovered; then proceed to the delivery of the child, which, when the navel-ſtring is cut and tied, may be committed to the nurſe. The next care is to wipe the blades of the forceps, ſingly, under the cloaths, ſlide them warily into your pockets, and deliver the placenta.

When the forehead is to the Os Pubis.

When the forehead, inſtead of being towards the ſacrum, is turned forwards to the os pubis, the woman muſt be laid in the ſame poſition as in the former caſe; becauſe here alſo, the ears of the child are towards the ſides of the pelvis, or a little diagonally ſituated, provided the forehead is towards one of the groins. The blades of the forceps being introduced along the ears, or as near them as poſſible, according to the foregoing directions, the head muſt be puſhed up a little, and the forehead turned to one ſide of the pelvis; thus let it be brought along, until the hindhead arrives at the lower part of the iſchium: then the forehead muſt be turned backward, into the hollow of the ſacrum, and even a quarter or more to the contrary ſide, in order to prevent the ſhoulders from hitching on the upper part of the os pubis, or ſacrum, ſo that they may be ſtill towards the ſides of the pelvis; then let the quarter turn be reverſed, and the forehead being replaced in the hollow of the ſacrum, the head may be extracted as above. In performing theſe different turns, let the head be puſhed up or pulled down occaſionally, as it meets with leaſt reſiſtance. In this caſe, when the head is ſmall, it will come along as it preſents; but if large, the chin will be ſo much preſſed againſt the breaſt, that it cannot be brought up with the belt round turn, and the woman will be tore if it comes along. See Plate CXII. where

Fig. 3. ſhews the head of the fœtus, by ſtrong labour-pains, ſqueezed into a longiſh form, with a tumour on the vertex, from a long compreſſion of the head in the pelvis.

K, The tumour on the vertex.

L, The forceps.

M, The veſica urinaria much diſtended with a large quantity of urine from the long preſſure of the head againſt the urethra.

N, The under part of the uterus.

OO. The os uteri.

When it preſents fair at the brim of the Pelvis.

When the forehead and face of the child are turned to the ſide of the pelvis, (in which caſe it is higher than in the firſt ſituation), it will be difficult, if the woman lies on her back, to introduce the forceps ſo as to graſp the head with a blade over each ear; becauſe the head is often preſſed ſo hard againſt the bones, in this poſition, that there is no room to inſinuate the fingers between the ear and the os pubis, ſo as to introduce the blades ſafely, on the inſide of the os internum, or puſh one of them up between the fingers and the child's head. When things are ſo ſituated, the beſt poſture for the woman is that of lying on one ſide, as formerly directed, becauſe the bones will yield a little, and the forceps (of conſequence) may be the more eaſily introduced.

Suppoſe her lying on her left ſide, and the forehead of the child turned to the ſame ſide of the pelvis; let the fingers of the operator's right hand be introduced along the ear, between the head and the os pubis, until they paſs the os internum: if the head is ſo immoveably fixed in the pelvis, that there is no paſſage between them, let his left hand be puſhed up between the ſacrum and the child's head, which being raiſed as high as poſſible, above the brim of the pelvis, he will have room ſufficient for his fingers and forceps; then let him ſlide up one of the blades, with the right hand, remembering to preſs the handle backwards to the perinæum, that the point may humour the turn of the ſacrum and child's head: this being effected, let him withdraw his left hand, with which he may hold the handle of the blade, already introduced, while he inſinuates the fingers of his right hand at the os pubis, as before directed, and puſhes up the other blade, ſlowly and gently, that he may run no riſk of hurting the os internum or bladder; and here alſo keep the handle of it as far backwards as the perinæum will allow: when the point has paſſed the os internum, let him ſlide it up farther, and join the legs by locking them together, keeping them ſtill in a line with the middle ſpace betwixt the navel and ſcrobiculus cordis. Then let him pull along the head, moving it from ſide to ſide, or from one ear of the child to the other; when it is ſufficiently advanced, let him move the forehead into the hollow of the ſacrum, and a quarter-turn farther, then bring it back into the ſame cavity; but, if the head will not eaſily come along, let the woman be turned on her back after the forceps have been fixed, and the handles firmly tied with a garter or fillet; let the hindhead be pulled half round outwards, from below the os pubis, and the inſtrument and child managed as before.

In all thoſe caſes that require the forceps, if the head cannot be raiſed above the brim of the pelvis, or the fingers introduced within the os internum, to guide the points of the forceps along the ears, eſpecially at the oſſa pubis, iſchia, or ſacrum; let the fingers and hand be puſhed up as far as they will go, along the open ſpace betwixt the ſacrum and iſchium; then one of the blades may be introduced, moved to, and fixed over the ear, the ſituation of which is already known: the other hand may be introduced, and the other blade conducted in the ſame manner, on the oppoſite ſide of the pelvis; but, before they

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they are locked together, care muſt be taken that they are exactly oppoſite to each other, and both ſufficiently introduced. In this caſe, if the operator finds the upper part of the ſacrum jetting, in ſo much that the point of the forceps cannot paſs it, let him try with his hand to turn the forehead a little backwards, ſo that one ear will be towards the groin, and the other towards the ſide of that prominence; conſequently, there will be more room from the blades to paſs along the ears: but if the forehead ſhould remain immoveable, or though moved return to its former place, let one blade be introduced behind one ear, and its fellow before the other, in which caſe the introduction is ſometimes more eaſily performed when the woman lies on her back, than when ſhe is laid on one ſide. See Plate CXII. fig. 2.

When the FACE *preſents.*

WHEN the face preſents, reſting on the upper part of the pelvis, the head ought to be puſhed up to the fundus uteri, the child turned and brought by the feet, becauſe the hind head is turned back on the ſhoulders, and, unleſs very ſmall, cannot be pulled along with the forceps; but ſhould it advance pretty faſt in the pelvis, it will be ſometimes delivered alive, without any reſiſtance. But, if it deſcends ſlowly, or, after it is low down, ſticks for a conſiderable time, the long preſſure on the brain frequently deſtroys the child, if not relieved in time, by turning or extracting with the forceps.

When the head is detained very high up, and no ſigns of its deſcending appear, and the operator having ſtretched the parts with a view to turn, diſcovers that the pelvis is narrow, and the head large, he muſt not proceed with turning, becauſe after this hath been performed, perhaps with great difficulty, the head cannot be delivered without the aſſiſtance of the crotchet. No doubt it would be a great advantage in all caſes where the face or forehead preſents, if we could raiſe the head ſo as to alter the bad poſition, and move it ſo, with our hand, as to bring the crown of the head to preſent: and indeed this ſhould always be tried, and more eſpecially, when the pelvis is too narrow, or the head too large; and when we are dubious of ſaving the child by turning: but frequently this is impoſſible to be done, when the waters are evacuated, the uterus ſtrongly contracted on the child, and the upper part of the head ſo ſlippery as to elude our hold; inſomuch that, even when the preſſure is not great, we ſeldom ſucceed, unleſs the head is ſmall, and then we can ſave the child by turning. If you ſucceed, and the woman is ſtrong, go on as in natural labour; but, if this fails, then it will be more adviſeable to wait with patience for the deſcent of the head, ſo as that it may be delivered with the forceps; and conſequently the child may be ſaved; but, if it ſtill remains in its high ſituation, and the woman is weak and exhauſted, the forceps may be tried; and, ſhould they fail, recourſe muſt be had to the crotchet; becauſe the mother's life is always to be more regarded than the ſafety of the child.

When the face of the child is come down, and ſticks at the os externum, the greateſt part of the head is then ſqueezed down into the pelvis, and if not ſpeedily delivered, the child is frequently loſt by the violent compreſſion of the brain: beſides, when it is ſo low down, it ſeldom can be returned, on account of the great contraction of the uterus. In this caſe, when the chin is turned towards the os pubis, at the lower part of that bone, the woman muſt be laid on her back, the forceps introduced, as formerly directed in the firſt caſe, and when the chin is brought out from under the os pubis, the head muſt be pulled half round upwards; by which means the fore and hind head will be raiſed from the perinæum, and the under part of the os externum prevented from being tore.

If the chin points to either ſide of the pelvis, the woman muſt be laid on her ſide, the blades of the forceps introduced along the ears, one at the os pubis, and the other at the ſacrum; and the chin, when brought lower down, turned to the pubis, and delivered: for the pelvis being only two inches in depth at this place, the chin is eaſily brought from under it, and then the head is at liberty to be turned half round upwards; becauſe the chin being diſengaged from this bone, can be pulled up over it externally; by which means, two inches of room, at leaſt, will be gained, for the more eaſy delivery of the fore and hind head, which are now preſſed againſt the perinæum. When the chin is towards the ſacrum, the hind head preſſed back betwixt the ſhoulders, ſo that the face is kept from riſing up below the os pubis, the head muſt be puſhed up with the hand, to the upper part of the pelvis, and the forceps introduced and fixed on the ears; the hindhead muſt be turned to one ſide of the pelvis, while the chin is moved to the other ſide, and, if poſſible, to the lower part of the iſchium; then the hind head muſt be brought into the hollow of the ſacrum, with the chin below the os pubis, and delivered as above directed. If this cannot be done, let the operator try, with the forceps, to pull down the hind-head below the os pubis, and at the ſame time, with the fingers of the other hand, puſh the face and forehead backwards and upwards into the hollow of the ſacrum.

For when the chin points to the back part of the pelvis, the forehead is ſqueezed againſt the os pubis, while the hind-head is preſſed upon the back, betwixt the ſhoulders; ſo that the head cannot be delivered unleſs, the occiput can be brought out from below the os pubis, as formerly deſcribed. See Plate CXII. fig. 4, and 5.

FIG. 4. ſhews, in the lateral view the face of the child preſenting and forced down into the lower part of the pelvis, the chin being below the pubes, and the vertex in the concavity of the os ſacrum: The water being likewiſe all diſcharged, the uterus appears cloſely joined to the body of the child.

FIG. 5. ſhews, in a lateral view, the head of the child in the ſame poſition as in the former figure.

AB, The vertebræ of the loins, os ſacrum, and coccyx.
C, The os pubis of the left ſide.
D, The inferior part of the rectum.
E, The perinæum.
F, The left labium pudendi.
GGG, The uterus.

The ſum of all that has been ſaid on this head, may be comprehended in the following general maxims.

Young practitioners are often at a loſs to know and judge

judge by the touch in the vagina, when the head is far enough down in the baſon for uſing the forceps. If we were to take our obſervations from what we feel of the head at the os pubis, we ſhould be frequently deceived; becauſe in that place the pelvis is only two inches in depth, and the head will ſeem lower down than it really is: but if, in examining backwards, we find little or no part of it towards the ſacrum, we may be certain that all the head is above the brim: if we find it down as far as the middle of the ſacrum, one third of it is advanced; if as far down as the lower part, one half; and in this caſe, the largeſt part is equal with the brim. When it is in this ſituation, we may be almoſt certain of ſucceeding with the forceps; and when the head is ſo low as to protrude the external parts, they never fail. But theſe things will differ according to different circumſtances, that may occaſion a tedious delivery.

Let the operator acquire an accurate knowledge of the figure, ſhape, and dimenſions of the pelvis, together with the ſhape, ſize, and poſition of the child's head.

Let the breech of the woman be always brought forwards, a little over the bed, and her thighs pulled up to her belly, whether ſhe lies on her ſide or back, to give room to apply, and to move the forceps up or down, or from ſide to ſide.

Let the parts be opened and the fingers paſs the os internum; in order to which, if it cannot be otherwiſe accompliſhed, let the head be raiſed two or three inches, that the fingers may have more room; if the head can be raiſed above the brim, your hand is not confined by the bones; for, as we have already obſerved, the pelvis is wider from ſide to ſide, at the brim, than at the lower part; if the fingers are not paſt the os uteri, it is in danger of being included betwixt the forceps and the child's head.

The forceps, if poſſible, ſhould paſs along the ears, becauſe, in that caſe, they ſeldom or never hurt or mark the head.

They ought to be puſhed up in an imaginary line, towards the middle ſpace between the navel and ſcrobiculus cordis, otherwiſe the ends will run againſt the ſacrum.

The forehead ought always to be turned into the hollow of the ſacrum, when it is not already in that ſituation. When the face preſents, the chin muſt be turned to below the os pubis, and the hind-head into the hollow of the ſacrum.

When the ſhoulders reſt at the pubes, where they are detained, the head muſt be turned a large quarter to the oppoſite ſide, ſo as that they may lie towards the ſides of the pelvis.

The head muſt always be brought out with an half round turn, over the outſide of the os pubis, for the preſervation of the perinæum, which muſt at the ſame time be ſupported with the flat of the other hand, and ſlide gently backwards over the head.

When the head is ſo low as to protrude the parts, in form of a large tumour, and the vertex hath begun to dilate the os externum, but, inſtead of advancing, is long detained in that ſituation, from any of the forementioned cauſes of laborious caſes, and the operator cannot exactly diſtinguiſh the poſition of the head, let him introduce a finger between the os pubis and the head, and he will frequently find the back part of the neck, or one ear, at the forepart, or towards the ſide of the pelvis: when the ſituation is known, he needs not ſtretch the os externum, and raiſe the head, as formerly directed; but he may introduce the forceps, and they being properly joined, and their handles tied, pull gently during every pain; or if the pains are gone, at the interval of four or five minutes, that the parts may be ſlowly dilated, as they are in the natural labour: but, when the ſituation cannot be known, the head ought to be raiſed. The ſame method may alſo be taken when the face preſents, and is low in the pelvis, except when the chin is toward the back part: and in this caſe, the head ought to be raiſed likewiſe.

Almoſt all theſe directions are to be followed, except when the head is ſmall, in which caſe it may be brought along by the force of pulling: but this only happens when the woman is reduced, and the labour-pains are not ſufficient to deliver the child; for, the lower part of the uterus may be ſtrongly contracted before the ſhoulders, and ſo cloſe to the neck of the child, as to prevent its advancing, even when the head is ſo looſe in the pelvis, that we can ſometimes puſh our fingers all round it: and this is oftenеſt the occaſion of preventing the head's being delivered when low in the pelvis. The difficulty, when high up, is from the reſtraint at the brim; and when it paſſes that, the head is ſeldom retained in the lower part, unleſs the patient is weak. In this caſe, we need not wait, becauſe we are commonly certain of relieving the woman immediately with the forceps, by which you prevent the danger that may happen both to the mother and child, by the head's continuing to lodge there too long. This caſe ſhould be a caution againſt breaking the membranes too ſoon, becauſe the uterus may contract too forcibly and too long before the ſhoulders; when the head in this caſe is advanced one third or half way on the outſide of the os externum, if the pains are ſtrong, this laſt inconvenience is frequently remedied by introducing your two fingers into the rectum, as formerly directed: by theſe rules, delivery may (for the moſt part) be performed with eaſe and ſafety: nevertheleſs, the head is ſometimes ſo ſqueezed and locked in the pelvis, and the hairy ſcalp ſo much ſwelled, that it is impracticable to raiſe up the head ſo as to come at the ears or os internum; or to diſtinguiſh the ſutures of the ſkull, ſo as to know how the heads preſents. In this caſe, the forceps muſt be introduced at random, and the uncertainty of the poſition generally removed by remembering, that in thoſe caſes, where the head is ſqueezed down with great difficulty, the ears are for the moſt part towards the os pubis and ſacrum; and that the forehead ſeldom turns into the hollow of the ſacrum, before the occiput is come down to the lower part of the iſchium; and then riſes gradually towards the under part of the os pubis, and the perinæum and anus are forced down before it, in form of a large tumour.

On ſuch occaſions, the woman being laid on her ſide, if one ear is to the ſacrum and the other to the os pubis, the blades of the forceps are to be introduced; and if they meet with any reſiſtance at the points, they muſt not be forcibly thruſt up, leſt they paſs on the outſide of the os uteri, and tear the vagina, which, together with the womb

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womb, would be included in the inſtrument, and pulled along with the head: for this reaſon, if the blade does not eaſily paſs, let it be withdrawn a little downwards, as before directed, and puſhed up again, moving the point cloſe to the head; if the ear obſtructs its paſſage, let the point be brought a little outwards: and by theſe cautious eſſays, it will at length paſs without further reſiſtance, and ought to be advanced a conſiderable way, in order to certify the operator that he is not on the outſide of the os internum.

When the forceps are fixed, and the operator uncertain which way the forehead lies, let him pull ſlowly, and move the head with a quarter turn, firſt to one ſide and then to the other, until he ſhall have found the direction in which it comes moſt eaſily along.

If at any time we find the forceps begin to ſlip, we muſt reſt, and puſh them up again gently: but, if they are like to ſlide off at a ſide, untie the handles, and move them ſo as to take a firmer hold, fix as before, and deliver. If we are obliged to hold with both hands, the parts may be ſupported by the firm application of an aſſiſtant's hand; for, without ſuch cautious management, they will run a great riſk of being lacerated; a misfortune which rarely happens, when the perinæum is properly preſſed back, and the head leiſurely delivered. Sometimes, when the head is brought low down, you may take off the forceps, and help along with your fingers on each ſide of the coccyx, or in the rectum, as directed in the natural labour.

If the head is low down, the ears are commonly diagonal, or to the ſides; and when the head is brought down one third, or one half, through the os externum, the operator can then certify himſelf, whether the forehead is turned to the coccyx or os pubis, by feeling with his finger for the back-part of the neck or ear, betwixt the os pubis and the head; and then move the head as above directed.

Let him try to alter with his hand every bad poſition of the head; and if it be detained high up in the pelvis, in conſequence of the woman's weakneſs, the rigidity of the parts, the circumvolutions or ſhortneſs of the funis, or the contraction of the uterus over the ſhoulders of the child, the forceps will frequently ſucceed when the fœtus cannot be turned: but, if the head is large, or the pelvis narrow, the child is ſeldom ſaved either by turning or uſing the forceps, until the head ſhall be farther advanced. And here it will not be amiſs to obſerve, that the blades of the forceps ought to be new covered with ſtripes of waſhed leather after they ſhall have been uſed, eſpecially in delivering a woman ſuſpected of having an infectious diſtemper.

The ſigns of a Dead Child.

WHEN the head preſents, and cannot be delivered by the labour-pains; when all the common methods have been uſed without ſucceſs, the woman being exhauſted, and all her efforts vain; and when the child cannot be delivered without ſuch force as will endanger the life of the mother, becauſe the head is too large or the pelvis too narrow; it then becomes abſolutely neceſſary to open the head, and extract with the hand, forceps, or crotchet. Indeed this laſt method formerly was the common practice when the child could not be eaſily turned, and is ſtill in uſe with thoſe who do not know how to ſave the child by delivering with the forceps: for this reaſon, their chief care and ſtudy was to diſtinguiſh whether the fœtus was dead or alive; and as the ſigns were uncertain, the operation was often delayed until the woman was in the moſt imminent danger; or when it was performed ſooner, the operator was frequently accuſed of raſhneſs, on the ſuppoſition that the child might in time have been delivered alive by the labour-pains: perhaps he was ſometimes conſcious to himſelf of the juſtice of this imputation, although what he had done was with an upright intention.

The ſigns of a dead fœtus were, firſt, the child's ceaſing to move and ſtir in the uterus. Secondly, The evacuation of meconium, though the breech is not preſſed into the pelvis. Thirdly, No perceivable pulſation at the fontanelle and temporal arteries. Fourthly, A large ſwelling or tumour of the hairy ſcalp. Fifthly, An uncommon laxity of the bones of the cranium. Sixthly, The diſcharge of a fœtid ichor from the vagina, the effluvia of which ſurround the woman and gave riſe to the opinion that her breath conveyed a mortified ſmell. Seventhly, Want of motion in the tongue, when the face preſents. Eightly, No perceivable pulſation in the arteries of the funis umbilicalis, when it falls down below the head; nor at the wriſt when the arm preſents; and no motion of the fingers. Ninthly, The pale and livid countenance of the woman. Tenthly, A collapſing and flaccidity of the breaſt. Eleventhly, A coldneſs felt in the abdomen, and weight, from the child's falling like a heavy ball to the ſide on which ſhe lies. Twelfthly, A ſeparation of the hairy ſcalp on the ſlighteſt touch, and a diſtinct perception of the bare bones.

All or moſt of theſe ſigns are dubious and uncertain, except the laſt, which can only be obſerved after the fœtus hath been dead ſeveral days. One may alſo certainly pronounce the child's death, if no pulſation hath been felt in the navel ſtring for the ſpace of twenty or thirty minutes; but the ſame certainty is not to be acquired from the arm, unleſs the ſkin can be ſtripped off with eaſe.

When the CROTCHET *is to be uſed.*

MIDWIFERY is now ſo much improved, that the neceſſity of deſtroying the child does not occur ſo often as formerly: indeed it never ſhould be done, except when it is impoſſible to turn, or to deliver with the forceps; and this is ſeldom the caſe but when the pelvis is too narrow, or the head too large to paſs, and therefore reſts above the brim: for this reaſon, it is not ſo neceſſary for the operator to puzzle himſelf about dubious ſigns; becauſe in theſe two caſes, there is no room for heſitation: for if the woman cannot poſſibly be delivered in any other way, and is in imminent danger of her life, the beſt practice is undoubtedly to have recourſe to that method which alone can be uſed for her preſervation, namely, to diminiſh the bulk of the head.

In this caſe, inſtead of deſtroying, you are really ſaving a life; for, if the operation be delayed, both mother and child are loſt.

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The method of uſing the Sciſſars, blunt Hook, and CROTCHET.

WHEN the head preſents, and ſuch is the caſe that the child can neither be delivered by turning, nor extracted with the forceps, and it is abſolutely neceſſary to deliver the woman to ſave her life, this operation muſt then be performed in the following manner.

The operator muſt be provided with a pair of curved crotchets, made according to the improvements upon thoſe propoſed by Meſnard, together with a pair of ſciſſars about nine inches long, with reſts near the middle of the blades, and the blunt hook.

Of the Woman's Poſture.

THE patient ought to be laid on her back or ſide in the ſame poſition directed in the uſe of the forceps; the operator muſt be ſeated on a low chair, and the inſtruments concealed and diſpoſed in the ſame manner, and for the ſame reaſon mentioned in treating of the forceps. The parts of the woman have already, in all likelihood, been ſufficiently dilated by his endeavours to turn or deliver with the forceps; or if no efforts of that kind have been uſed, becauſe by the touch he had learned that no ſuch endeavours would ſucceed, as in the caſe of a large hydrocephalus, when the bones of the cranium are often ſeparated at a great diſtance from each other; or upon perceiving that the pelvis was extremely narrow: If, upon theſe conſiderations, he hath made no trials in which the parts were opened, let him gradually dilate the os externum and internum, as formerly directed.

The head is commonly kept down pretty firm, by the ſtrong contraction of the uterus round the child; but ſhould it yield to one ſide, let it be kept ſteady by the hand of an aſſiſtant, preſſing upon the belly of the woman; let him introduce his hand, and preſs two fingers againſt one of the ſutures of the cranium; then take out his ſciſſars from the place in which they were depoſited, and guiding them by the hand and fingers till they reach the hairy ſcalp, puſh them gradually into it, until their progreſs is ſtopped by the reſts.

If the head ſlips aſide, in ſuch a manner, as that they cannot be puſhed into the ſkull at the ſuture, they will make their way through the ſolid bones, if they are moved in a ſemicircular turn, like the motion of boring, and this method continued till you find the point firmly fixed; for, if this is not obſerved, the points ſlide along the bones.

The ſciſſars ought to be ſo ſharp at the points, as to penetrate the integuments and bones when puſhed with a moderate force; but not ſo keen as to cut the operator's fingers, or the vagina in introducing them.

The ſciſſars being thus forced into the brain, as far as the reſts at the middle of the blades, let them be kept firm in that ſituation; and the hand that was in the vagina being withdrawn, the operator muſt take hold of the handles with each hand, and pull them aſunder, that the blades may dilate and make a large opening in the ſkull; then they muſt be ſhut, turned, and again pulled aſunder, ſo as to make the inciſion crucial; by which means the opening will be enlarged, and ſufficient room made for the introduction of the fingers: let them be afterwards cloſed, and introduced even beyond the reſts; when they muſt again be opened, and turned half round from ſide to ſide, until the ſtructure of the brain is ſo effectually deſtroyed, that it can be evacuated with eaſe. This operation being performed, let the ſciſſars be ſhut and withdrawn; but, if this inſtrument will not anſwer the laſt purpoſe, the buſineſs may be done by introducing the crotchet within the opening of the ſkull. The brain being thus deſtroyed, and the inſtrument withdrawn, let him introduce his right hand into the vagina, and two fingers into the opening which hath been made, that if any ſharp ſplinters of the bones remain, they may be broken off and taken out; leſt they ſhould injure the woman's vagina, or the operator's own fingers.

If the caſe be an hydrocephalus, let him fix his fingers on the inſide and his thumb on the outſide of the opening, and endeavour to pull along the ſkull in time of a pain; but, if labour is weak, he muſt deſire the woman to aſſiſt his endeavours by forcing down; and thus the child is frequently delivered; becauſe, the water being evacuated, the head collapſes of courſe.

But when the pelvis is narrow, the head requires much greater force to be brought along; unleſs the labour-pains are ſtrong enough to preſs it down and diminiſh it, by ſqueezing out the cerebrum: in this caſe, let the operator withdraw his fingers from the opening, and, ſliding them along the head, paſs the os uteri; then, with his left hand, taking one of the crotchets from the place of its concealment, introduce it along his right hand, with the point towards the child's head, and fix it above the chin in the mouth, back part of the neck, or above the ears, or in any place where it will take firm hold: having fixed the inſtrument, let him withdraw his right hand, and with it take hold on the end or handle of the crotchet; then introduce his left to ſeize the bones at the opening of the ſkull (as above directed) that the head may be kept ſteady, and pull along with both hands.

If the head is ſtill detained by the uncommon narrowneſs of the pelvis, let him introduce his left hand along the oppoſite ſide, in order to guide the other crotchet; which being alſo applied and locked or joined with its fellow, in the manner of the forceps, he muſt pull with ſufficient force, moving from ſide to ſide, and as it advances, turn the ſore head into the hollow of the ſacrum, and extract as with the forceps, humouring the ſhape of the head and pelvis during the operation, which ought to be performed ſlowly, with great judgment and caution; and from hence it appears abſolutely neceſſary to know how the head preſents, in order to judge how the crotchet muſt be fixed, and the head brought along to the beſt advantage.

If, when the head is delivered in this manner, the body cannot be extracted, on account of its being much ſwelled, of a monſtrous ſize, or (which is moſt commonly the caſe) the narrowneſs of the pelvis; let him deſiſt from pulling, leſt the head ſhould be ſeparated from the body, and introducing one hand ſo as to reach with his fingers to the ſhoulder-blades or breaſt, conduct along it one of the crotchets, with the point towards the fœtus, and fix it with a firm application; then withdrawing his hand, employ it in pulling the crotchet, while the other

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is exerted in the ſame manner upon the head and neck of the child: if the inſtrument begins to loſe its hold, he muſt puſh it farther up, and fixing it again, repeat his efforts, applying it ſtill higher and higher, until the body is extracted.

Of Preternatural Labours.

Preternatural labour happens, when, inſtead of the head, ſome other part of the body preſents to the os uteri. Preternatural labours are more or leſs difficult according to the preſentation of the child, and the contraction of the uterus round its body. The nearer the head and ſhoulders are the os internum or lower part of the uterus, the more difficult is the caſe; whereas, when the head is towards the fundus, and the feet or breech near the os internum, it is more eaſy to turn and deliver.

To begin with the eaſieſt of theſe firſt, it may be proper to divide them into three claſſes. Firſt, how to manage when the feet, breech, or lower parts preſent. Secondly, how to behave in violent floodings; and, when the child preſents wrong before the membranes are broke, how to ſave the waters in the uterus, that the fœtus may be the more eaſily turned: and what method to follow even after the membranes are broke, when all the waters are not evacuated. Thirdly, how to deliver when the uterus is ſtrongly contracted, the child preſenting either with the fore or back parts; and lying in a circular form, or with the ſhoulders, breaſt, neck, face, ear, or vertex, and lying in a longiſh form, with the feet and breech towards the fundus of the womb, which is contracted like a long ſheath, cloſe to the body of the fœtus; and when the fore-parts of the child lie towards the ſide, fundus, fore or back part of the uterus.

The firſt claſs of Preternatural Labours. *When the feet, breech, or lower parts of the* fœtus *preſent, and the head, ſhoulders, and upper parts are towards the* fundus.

These, for the moſt part, are accounted the eaſieſt, even although the uterus ſhould be ſtrongly contracted round the body of the child, and all the waters diſcharged.

If the knees or feet of the child preſent to the os internum, which is not yet ſufficiently dilated to allow them and the body to come farther down; or, if the woman is weak, wore out with long labour, or endangered by a flooding; let the operator introduce his hand into the vagina, puſh up and ſtretch the os uteri, and bring along the feet; which being extracted, let him wrap a linen cloth round them, and pull until the breech appears on the outſide of the os externum: if the face or fore-part of the fœtus is already towards the back of the uterus, let him perſiſt in pulling in the ſame direction; but, if they are towards the os pubis, or to one ſide, they muſt be turned to the back-part of the uterus; and as the head does not move round equal with the body, he muſt make allowance for the difference in turning, by bringing the laſt one quarter farther than the place at which the head is to be placed; ſo that the face or forehead which was towards one of the groins will be forced to the ſide of the ſacrum, where it joins with the iſchium. This quarter turn of the body muſt be again undone, without affecting the poſition of the head; a cloth may be wrapped round the breech, for the convenience of holding it more firmly; then, placing a thumb along each ſide of the ſpine, and with his fingers graſping the belly, let him pull along the body from ſide to ſide, with more or leſs force, according to the reſiſtance: when the child is delivered as far as the ſhoulders, let him ſlide his hand flattened (ſuppoſe the right, if ſhe lies on her back) between its breaſt and the perinæum, coccyx, and ſacrum of the woman, and introduce the fore or middle finger (or both, if neceſſary) into the mouth of the fœtus; by which means, the chin will be pulled to the breaſt, and the forehead into the hollow of the ſacrum. And this expedient will alſo raiſe upwards the hindhead, which reſts at the os pubis.

When the forehead is come ſo low as to protrude the perinæum, if the woman lies on her back, let the operator ſtand up, and pull the body and head of the child upwards, bringing the forehead with an half-round turn from the under-part of the os externum, which will thus be defended from laceration. The application of the fingers in the child's mouth will contribute to bring the head out in this manner, prevent the os externum from hitching on the chin, help along the head, and guard the neck from being overſtrained; a misfortune which would infallibly happen, if the forehead ſhould be detained at the upper part of the ſacrum: nor is there any great force required to obviate this inconvenience, or the leaſt danger of hurting the mouth, if the head is not large: for, if the head cannot be brought along with moderate force, and the operator is afraid of injuring or over-ſtraining the lower jaw, let him puſh his fingers farther up, and preſs on each ſide of the noſe, or on the inferior edges of the ſockets of the eyes. If the legs are come out, and the breech pulled into the vagina, there is no occaſion for puſhing up to open, but only to pull along and manage as above directed; ſtill remembring to raiſe the forehead ſlowly from the perinæum, which may be preſſed back with the fingers of his other hand.

In the caſe of a narrow pelvis, or large head, which cannot be brought along without the riſk of over-ſtraining the neck, let him ſlide up his fingers and hand into the vagina, and bring down one of the child's arms, at the ſame time pulling the body to the contrary ſide, by which means the ſhoulder will be brought lower down: let him run his fingers along the arm, until they reach the elbow, which muſt be pulled downwards with an half-round turn to the other ſide, below the breaſt. This muſt not be done with a jerk, but ſlowly and cautiouſly, in order to prevent the diſlocation, bending, or breaking of the child's arm.

Let him again guide his fingers into the child's mouth, and try if the head will come along: if this will not ſucceed, let the body be pulled to the other ſide, ſo as to bring down the other ſhoulder; then ſlide up his left hand, and, extracting the other arm, endeavour to deliver the head. If one finger of his right hand be fixed in the child's mouth, let the body reſt on that arm: let him place the left hand above the ſhoulders, and put a finger on each ſide of the neck: if the forehead is towards one

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ſide at the upper part of the pelvis, let him pull it lower down, and gradually turn it into the hollow of the ſacrum; then ſtand up, and, in pulling, raiſe the body, ſo as to bring out the head in an half-round turn, as above directed.

When the forehead is hindered from coming down into the lower part of the ſacrum by an uncommon ſhape of the head or pelvis, and we cannot extract it by bringing it out with an half-round turn at the os pubis, we muſt try to make this turn in the contrary direction; and inſtead of introducing our fingers into the child's mouth, let the breaſt of it reſt on the palm of your left hand, (the woman being on her back,) and placing the right on its ſhoulders, with the fingers on each ſide of the neck, preſs it downwards to the perinæum. In conſequence of this preſſure, the face and chin being within the perinæum, will move more upwards, and the head come out with an half-round turn from below the os pubis: for the centre of motion is now where the fore-part of the neck preſſes at the perinæum; whereas, in the other method, the back part of the neck is againſt the lower part of the os pubis, on which the head turns.

If the forehead is not turned to one ſide, but ſticks at the upper part of the ſacrum, eſpecially when the pelvis is narrow; let him endeavour, with his finger in the mouth, to turn it to one ſide of the jetting in of the ſacrum, becauſe the pelvis is wider at the ſides of the brim, and bring it along as before.

If one of the child's arms, inſtead of being placed along the ſides of the head, is turned in between the face and ſacrum, or between the hindhead and os pubis, the ſame difficulty of extracting occurs as in a large head or narrow pelvis; and this poſition frequently enſues, when the fore-parts of the child's body are turned from the os pubis down to the ſacrum: if they are turned to the left ſide of the woman, the left hand and arm are commonly brought in before the face, and *vice verſa*; but, in theſe caſes, the elbow is, for the moſt part, eaſily come at, becauſe it is low down in the vagina, and then there is a neceſſity for bringing down one or both arms before the head can be delivered: from whence we may conclude, that thoſe authors are ſometimes in the wrong, who expreſsly forbid us to pull down the arms. Indeed, if the pelvis is not narrow, nor the head very large, and the arms lie along the ſides of the head, there is ſeldom occaſion to pull them down; becauſe, the pelvis is wideſt at the ſides, and the membranes and ligaments that fill up the ſpace betwixt the ſacrum and iſchia yield to the preſſure, and make room for the paſſage of the head: but when they are ſqueezed between the head and the ſacrum, iſchia, or oſſa pubis, and the head ſticks in the pelvis, they certainly ought to be brought down, or even when the head comes along with difficulty. Neither is the alledged contraction of the os internum round the neck of the child ſo frequent as hath been imagined; becauſe, for the moſt part the contraction embraces the head and not the neck: but, ſhould the neck alone ſuffer, that inconvenience may be removed by introducing the hand into the vagina, and a finger or two into the child's mouth, or on each ſide of the noſe: by which means alſo a ſufficient dilatation will be preſerved in the os externum, which frequently contracts on the neck, as ſoon as the arms are brought out.

The diameter, from the face or forehead to the vertex, being greater than that from the forehead to the back part of the hindhead or neck, when the hindhead reſts at the os pubis, and the forehead at the upper part of the ſacrum, the head can ſeldom be brought down, until the operator, by introducing a finger into the mouth, moves the ſame to the ſide, brings the chin to the breaſt, and the forehead into the hollow of the ſacrum; by which means, the hindhead is raiſed, and allowed to come along with greater eaſe: and in pulling, half the force only is applied to the neck, the other half being exerted upon the head, by the finger which is fixed in the mouth; ſo that the forehead is more eaſily brought out, by pulling upwards, with the half-round turn from the perinæum. When the operator, with his fingers in the child's mouth, cannot pull down the forehead into the hollow of the ſacrum, let him puſh the fore-finger of his left hand betwixt the neck and os pubis, in order to raiſe the hindhead upwards; which being done, the forehead will come down with leſs difficulty, eſpecially if he puſhes up and pulls down at the ſame time, or alternately.

If it be diſcovered by the touch, that the breech preſents, that the membranes are not yet broke, the woman in no danger, the os internum not yet ſufficiently dilated, and the labour-pains ſtrong; the midwife ought to wait until the membranes, with the waters, are puſhed farther down, as in the natural labour: for, as they come down through the os uteri into the vagina, they ſtretch open the parts contained in the pelvis; and the bulk within the uterus being diminiſhed, it contracts and comes in contact with the body of the child; ſo that the breech is puſhed along by the mechanical force of the abdominal muſcles operating upon the womb.

The ſame conſequence will follow even although the membranes are broke; for the waters lubricate the parts as they flow off; and the breech, if not too large, or the pelvis narrow, is puſhed down. In this caſe, when the nates preſent equal and fair to the os uteri, ſo it is alſo reaſonable to conclude, that when the breech preſents, it lies in the ſame manner, but that the fore-parts of the child are rather turned backwards to one ſide of the vertebræ of the loins: in this poſition, one hip will preſent, and the other reſt on the os pubis; but, when forced along with pains, the laſt will be gradually moved more and more to the groin of that ſide, and from thence ſlip down at the ſide of the baſin: the lower at the ſame time will be forced to the other, and the hollow betwixt the thighs will reſt upon the jetting in of the os ſacrum, and come down in that manner; the thighs on each ſide, and the back and round part of the breech paſſing in below the arch of the os pubis, which is the beſt poſition: but if the back of the child is tilted backwards, then it will be forced down in the contrary direction, and come along with more difficulty, *viz.* the thighs to the os pubis, and back to the ſacrum; when it is come down to the middle or lower part of the pelvis, let the operator introduce the fore-finger of each hand, along the outſide, to the groins, and, taking hold, pull gently along during a ſtrong pain.

If the os externum is ſo contracted, that he cannot take

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take ſufficient hold, let it be opened ſlowly, ſo as to allow his hands to be puſhed up with eaſe; when he has inſinuated a finger or two in each groin, let him place his thumbs on the thighs, if they are towards the oſſa pubis, ſo as to obtain a firm hold; then pull along from ſide to ſide, and, if the back of the child is to the os pubis, continue to aſſiſt in this manner, until the body and head are delivered: the legs being commonly ſtretched up along the belly and breaſt, when the child is extracted as far as the ſhoulders, they come out of themſelves, or are eaſily brought down; but, if the belly of the child is turned to one ſide, or to the os pubis, in that caſe, when the breech is delivered, he ought to turn the belly down to the ſacrum, and the back to the os pubis; and that the face may be alſo turned to the back of the mother, let him remember the quarter extraordinary, which muſt be again reverſed, and then he may pull along and deliver.

If the body cannot be turned until the thighs and legs are brought down, either on account of the bulk, or becauſe the hold on the breech is not ſufficient, let him continue to pull along, until the hams appear on the outſide of the os externum; then ſeize one of the knees with his finger and thumb, and extract that leg; and let the other be brought down in the ſame manner. If he attempts to pull out the legs, before the hams arrive at this place, the thighs are always in danger of being bent or broke. When the legs are delivered, let him wrap a cloth round the breech of the child, and as the body was pulled down almoſt as far as the breaſt, before the legs could be brought out, it muſt be puſhed up again to the navel, or above it; becauſe, without this precaution, the ſhoulders would be ſo much engaged in the pelvis, that it would be impracticable to make the motions formerly directed, ſo as to turn the face to the back of the mother: whereas, when the body is puſhed up, thoſe turns can be effected with greater eaſe, becauſe the belly being in the pelvis, it yields eaſier to the form of the baſin. When the face is turned properly down, let him proceed to deliver, as above directed.

If the breech is detained above the pelvis, either by its uncommon magnitude, or the narrowneſs of the baſin; or if one of the nates is puſhed in, while the other reſts above the os pubis, ſacrum, or to either ſide; if the woman is low and weak, the pains lingering and inſufficient to force the child along; or if ſhe is in danger from a violent flooding: in any of theſe caſes, let him (during every pain) gradually open firſt the os externum, and then the os internum, with his fingers and hand. Having thus gained admiſſion, let him puſh up the breech to the fore or back part, or to one ſide of the uterus, that his hand and arm may have room to ſlide along the fore-parts or belly of the child, ſo as to feel the thighs, that will direct him to the legs, which muſt be brought down with his fingers, while, at the ſame time, he puſhes up the hams with his thumb, that in caſe the legs lie ſtraight up, they may be extracted with more eaſe by the flection of the knee, and run the leſs riſk of being bent, broke, or overſtrained: for, if they are folded downward, they are the more eaſily brought out.

If the breech be ſtrongly preſſed into the upper part of the pelvis, let him alſo puſh it upwards and to one ſide, that his hand and arm may have free paſſage; for the higher the breech is raiſed out of his way, he will be at more freedom to extract the legs.

If both legs cannot be eaſily brought down, he may ſafely deliver with one, of which taking hold with a linen cloth wrapped round it, let him ſlide up his other hand into the vagina, and a finger or two into the outſide of the groin which is bent: by theſe means, the hip will come down the eaſier, and the leg, which is already extracted, will not be over-ſtrained by ſuſtaining the whole force of pulling the body along.

If the legs lie towards the left ſide of the woman, who is laid on her back, the right hand muſt be introduced into the uterus; if they lie to her right ſide, the left hand will better anſwer the purpoſe; and if they are towards her back or belly, either hand may be indifferently uſed.

In all caſes where the breech preſents, the ſafeſt practice is always to puſh up and bring down the legs, provided the os uteri is ſufficiently dilated, and the waters not wholly diſcharged. If the waters are evacuated, the uterus ſtrongly contracted around the child, the breech low, ſo as that it cannot be returned, or ſo ſmall as to come eaſily along, we ought then to deliver it accordingly; but, if ſo large as neither to be puſhed up or brought along with the aſſiſtance of the fingers, let the operator introduce the curved handle of the blunt crotchet into one of the groins, his fingers into the other, and pull very cautiouſly, in order to prevent a fracture or diſlocation of the thigh bone, which might otherwiſe happen from the uſe of this inſtrument, the blunt point of which muſt be ſufficiently paſt the groin. A fillet may alſo be uſed for the ſame purpoſe.

In the foregoing caſes the woman was ſuppoſed to be laid on her back, her legs ſupported, and breech to the bed-ſide; this being generally the beſt poſition for delivering the body and head: indeed, when the child is ſmall, ſhe may lie on her ſide, and the ſame methods be uſed in delivering, provided the operator ſtill remembers that in this poſition the ilium and iſchium of one ſide are down, and the others up. Beſides, when the breech is puſhed up, in order to bring down the legs, if they lie forewards towards the fore part of the uterus, and the belly is pendulous, he can reach them with the greateſt eaſe when ſhe lies on one ſide, or, if the reſiſtance is very great, turn her to her knees and elbows; but, when the legs are delivered, if the child is large, or the pelvis narrow, ſhe ought to be turned upon her back, becauſe the body and head can be better and ſafer delivered by pulling up and down; and in that poſture ſhe is alſo kept more firm, and her thighs leſs in the operator's way, than when ſhe lies upon her ſide. See Plate CXIII. fig. 1. and 2.

The ſecond claſs of PRETERNATURAL LABOURS.

WHEN the membranes are broke, but the face, ſhoulder, or ſome other part of the child, being puſhed into the pelvis, locks up the os internum, ſo as that a ſmall quantity of the waters hath been diſcharged, the uterus is kept from contracting ſtrongly round the child, which is therefore more eaſily turned than it poſſibly can be when they are all gone:

When

When, before the membranes are broke, the child is felt through them, preſenting wrong, and at the ſame time the pains puſh them down ſo as to dilate the os internum more or leſs:

When the woman, at any time in the four laſt months, is ſeized with a violent flooding that cannot be reſtrained, and unleſs ſpeedily delivered muſt loſe her life; if labour-pains cannot be brought on by ſtretching the parts, delivery muſt be forced; but, if ſhe is in labour, and the membranes have been puſhed down with the waters, they may be broke; by which means, the flooding is frequently diminiſhed, and the child delivered by the labour-pains.

In theſe three different caſes, if we can prevent the ſtrong contraction of the uterus by keeping up the waters, we can alſo for the moſt part turn the child with great eaſe, even in the very worſt poſitions.

In the firſt caſe, let the operator ſlowly introduce his hand into the vagina, and his fingers between that part of the child which is puſhed down, and the os internum: if in ſo doing he perceives ſome of the waters coming along, he muſt run up his hand as quick as poſſible into the uterus, betwixt the inſide of the membranes and the child's body; the lower part of his arm will then fill up the os externum like a plug, ſo that no more of the waters can paſs; let him turn the child with its head and ſhoulders up to the fundus, the breech down to the lower part of the uterus, and the fore parts towards the mother's back; let the hand be puſhed no farther up than the middle of the child's body, becauſe, if it is advanced as high as the fundus, it muſt be withdrawn lower, before the child can be turned; and by theſe means the waters will be diſcharged, and the uterus of conſequence contract ſo as to render the turning more difficult.

In the ſecond caſe, when the membranes are not broke, and we are certain that the child does not preſent fair; if the os internum is not ſufficiently dilated, and the woman is in no danger, we may let the labour go on, until the parts are more ſtretched; lubricating and extending the os externum, by degrees, during every pain. Then introducing one hand into the vagina, we inſinuate it in a flattened form, within the os internum, and puſh up between the membranes and the uterus, as far as the middle of the womb: having thus obtained admiſſion, we break the membranes by graſping and ſqueezing them with our fingers, ſlide our hand within them, without moving the arm lower down, then turn and deliver as formerly directed; but if, in any of theſe caſes, you find the head is large or the pelvis narrow, bring down the head into the natural poſition, and aſſiſt as directed in lingering or laborious caſes.

If the woman (in the third caſe) is attacked with a violent flooding, occaſioned by a ſeparation of all or any part of the placenta from the uterus, during the laſt four months of pregnancy, and every method has in vain been tried to leſſen and reſtrain the diſcharge, the operator ought to pronounce the caſe dangerous, and prudently declare to the relations of the patient, that unleſs ſhe is ſpeedily delivered, both ſhe and the child muſt periſh, obſerving at the ſame time, that by immediate delivery they may both be ſaved: let him alſo deſire the aſſiſtance and advice of ſome perſon eminent in the profeſſion, for the ſatisfaction of her friends, and the ſupport of his own reputation. Where there are no labour-pains, and the mouth of the womb is not dilated, it is ſometimes very difficult to deliver, more eſpecially if the os internum is not a little lax, but feels rigid.

If the os uteri is ſo much contracted, that the finger cannot be introduced, ſome authors have recommended a dilator, by which it may be gradually opened ſo as to admit a finger or two. Doubtleſs, ſome caſes may happen, in which this may be neceſſary. If in ſtretching the os internum, labour-pains are brought on, let the operator ſlowly proceed and encourage them: when the mouth of the womb is opened, if the head preſents and the pains are ſtrong, by breaking the membranes the flooding will be diminiſhed; but, if ſhe floods to ſuch a degree as to be in danger of her life, and the dilatation does not bring on labour, at leaſt not enough for the occaſion, ſhe muſt be immediately delivered in the following manner: but in the firſt place let her friends be apprized of the danger, and the operator beware of promiſing to ſave either mother or child.

The operator having performed his duty in making the friends acquainted with the ſituation of the caſe, muſt gently open the os externum, by introducing his fingers gradually, turning them half round and puſhing upward; then forming them, with the thumb, into the figure of a wedge or cone, continue to dilate ſlowly and by intervals, until his hand is admitted into the vagina: having thus far gained his point, let him inſinuate, in the ſame ſlow cautious manner, firſt one, then two fingers, into the os internum, which may be dilated ſo as to admit the other two and the thumb in the ſame conical form, which will gradually make way for ſliding the hand along between the outſide of the membranes and inſide of the uterus; then he muſt manage as directed in the ſecond caſe: If, upon ſliding up his hand upon the outſide of the membranes, he feels the placenta adhering to that ſide of the womb, he muſt either withdraw that hand, and introduce the other on the oppoſite ſide, or break through the membranes at the lower edge of the placenta.

The greateſt danger in this caſe frequently proceeds from the ſudden emptying of the uterus and belly; for when labour comes on of itſelf, or is brought on in a regular manner, and the membranes are broke, the flooding is gradually diminiſhed, and firſt the child, then the placenta, is delivered by the pains; ſo that the preſſure or reſiſtance is not all at once removed from the belly and uterus of the woman, which have time to contract by degrees; conſequently, thoſe fainting-fits and convulſions are prevented which often proceed from a ſudden removal of that compreſſion under which the circulation was performed.

The younger the woman is with child, the greater is the difficulty in opening the os internum; and more ſo in the firſt child, eſpecially if ſhe is paſt the age of thirty-five.

We ſhould never refuſe to deliver in theſe dangerous caſes, even although the patient ſeems expiring: for, immediately after delivery, the uterus contracts; the mouths of the veſſels are ſhut up, ſo that the flooding ceaſes; and ſhe may recover, if ſhe lives five or ſix hours after

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after the operation, and can be ſupported by frequent draughts of broth, jelly, caudle, weak cordial, and anodyne medicines, which maintain the circulation, and gradually fill the empty veſſels.

If, in time of flooding, ſhe is ſeized with labour-pains, or if, by every now and then ſtretching with your fingers the os internum, you bring on labour, by which either the membranes or head of the child is puſhed down, and opens the os internum, the membranes ought to be broke; ſo that ſome of the waters being diſcharged, the uterus may contract and ſqueeze down the fœtus. This may be done ſooner in thoſe women who have had children formerly. If, notwithſtanding this expedient, the flooding ſtill continues, and the child is not like to be ſoon delivered, it muſt be turned immediately; or, if the head is in the pelvis, delivered with the forceps: but, if neither of theſe two methods will ſucceed, on account of the narrowneſs of the pelvis, or the bigneſs of the head, this laſt muſt be opened and delivered with the crotchet. In all theſe caſes, let the parts be dilated ſlowly and by intervals, in order to prevent laceration. See Plate CXI. fig. 4. 5. 6.

The third claſs of Preternatural Labours.

We have already obſerved, that the principal difficulties in turning children and bringing them by the feet, proceeded from the contraction of the uterus and bad poſition of the fœtus. If the child lies in a round form, whether the fore-parts are towards the os internum, or up to the fundus uteri, we can, for the moſt part, move it with the hand, ſo as to turn the head and ſhoulders to the upper part, and the breech and legs downwards; but if the child lies lengthways, the womb being contracted around it, like a long ſheath, the taſk is more difficult; eſpecially, if the head and ſhoulders of the child are down at the loweſt part of the uterus, with the breech and feet turned up to the fundus.

The hand of the operator being introduced into the uterus, if he finds the breech below the head and ſhoulders, let him ſearch for the legs, and bring them down: but if the breech be higher than the upper parts of the child, or equal with them, he muſt try to turn the head and ſhoulders to the fundus, and the breech downwards, by puſhing up the firſt, and pulling down the laſt; then proceed with delivery as before directed. This is commonly executed with eaſe, provided ſome part of the waters ſtill remain in the uterus; but, if the woman has been long in labour, and the waters diſcharged, the contraction of the womb is ſo ſtrong, that the child cannot be turned without the exertion of great force frequently repeated. In this caſe, the eaſieſt method both for the patient and operator, is to puſh up the hand gradually on that ſide to which the legs and thighs are turned; and even after he has reached them, if they are not very high up, let him advance his hand as far as the fundus uteri; he will thus remove the greateſt obſtacle, by enlarging the cavity of the womb, ſo as more eaſily to feel and bring down the legs: then he may puſh up and pull down, as we have preſcribed above: but, if the head and ſhoulders ſtill continue to hinder the breech and body from coming along, and the feet cannot be brought ſo low, as the outſide of the os externum, while they are yet in the vagina he may apply a nooſe upon one or both; for unleſs the child is ſo ſmall that he can turn it round by graſping the body when the head and ſhoulders are puſhed up, and he endeavours to bring down the other part, they will again return to the ſame place, and retard delivery: whereas, if he gains a firm hold of the feet, either without the os externum, or in the vagina, by means of the nooſe fixed upon the ancles, he can with the other hand puſh up the head and ſhoulder, and be able in that manner to bring down the breech. He muſt continue this method of puſhing up and pulling down, until the head and ſhoulder are raiſed to the fundus uteri; for ſhould he leave off too ſoon, and withdraw his hand, although the child is extracted as far as the breech, the head is ſometimes ſo preſſed down and engaged with the body in the paſſage, that it cannot be brought farther down without being tore along with the crotchet; for the breech and part of the body may block up the paſſage in ſuch a manner, as that the hand cannot be introduced to raiſe the head.

Thoſe caſes are commonly the eaſieſt in which the fore-parts preſent, and the child lies in a round or oval form, acroſs the uterus, or diagonally, when the head or breech is above and over the os pubis, with the legs, arms, and navel-ſtring, or one or all of them, at the upper or lower part of the vagina, or on the outſide of the os externum. Thoſe are more difficult in which, though the child lies in the ſame round or contracted form, the back, ſhoulders, belly, or breaſt, are over the os internum; becauſe if we cannot move the child round, ſo as to place the head to the fundus, the legs are brought down with much more difficulty than in the other caſe: but if the ſhoulder, breaſt, neck, ear, face, or crown of the head preſents, and the legs and breech are up to the fundus uteri, the caſe is ſtill more difficult; becauſe, in the other two, the uterus is contracted in a round form, ſo that the wrong poſition of the child is more eaſily altered than in this, when the womb is contracted in a long ſhape, and ſometimes requires vaſt force to ſtretch it, ſo as that the head may be raiſed to the fundus, and the legs and breech brought down.

The crown of the head is the worſt part that can preſent, becauſe in that caſe the feet and breech are higher, and the uterus of a longer form than in any other. The preſentation of the face is, next to this, attended with the greateſt difficulty: but when the neck, ſhoulder, back, or breaſt preſent, the head is turned upwards, and keeps the lower part of the womb diſtended: ſo that, upon ſtretching the upper part, the child's head is more eaſily raiſed to the fundus.

When the fore-parts of the child preſent, if the feet, hands, and navel-ſtring are not detained above the os uteri, ſome or all of them deſcend into the vagina, or appear on the outſide of the os externum. If one or more of them come down, and the child at the ſame time lies in a round form acroſs the uterus, let the accoucheur introduce his hand between them and the ſacrum. When it is paſt the os internum, let it reſt a little, while he feels with his fingers the poſition of the fœtus: if the head and ſhoulders lie higher than the breech, he muſt take hold of the legs and bring them down without the os internum:

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internum: if the breech is detained above the brim of the pelvis, let him ſlide up the flat of his hand along the buttocks, and pull down the legs with the other hand; by which method the breech is diſengaged and forced into the middle of the pelvis. See Plate CXIII. fig. 3.

In moſt of thoſe caſes where the child is preſſed in an oval form, if neither the head or breech preſent, the head is to one ſide of the uterus, and the breech to the other; becauſe it is wider from ſide to ſide, than from the back to the fore part; and if either the head or breech is over the os pubis, the other is turned off to the ſide: in moving the head or ſhoulders to the fundus, they are raiſed with greater eaſe along the ſide, than at the back or fore parts, for the ſame reaſons.

If the head and ſhoulders lie lower down, ſo as to hinder the breech from coming along, and the legs from being extracted, let him puſh up the head and ſhoulders to the fundus, and pull out the legs; then try to bring in the breech; and if it ſtill ſticks above, becauſe the head and ſhoulders are again forced down by the contraction of the uterus, he muſt with one hand take hold of the legs that are now without the os externum, and, ſliding the other into the uterus, puſh the head and ſhoulders again up to the fundus, while, at the ſame time, he pulls the legs and breech along with the feet. If the legs cannot be brought farther down than the vagina, becauſe the breech is high up, let him ſlip a nooſe over the feet round the ancles, as before obſerved; by which he may pull down the lower parts with one hand, while the other is employed in puſhing up, as before. By this double purchaſe, the child may be turned even in the moſt difficult caſes: but the operator, in pulling, muſt beware of overſtraining the ligaments of the joints.

If the legs can be extracted through the os externum, let a ſingle cloth, warmed, be wrapped round them, in order to yield a firmer hold to the accoucheur; but when they can be brought no lower than the neck of the uterus and vagina, he may uſe one of theſe following nooſes.

Let him take a ſtrong limber fillet, or ſoft garter half-worn, about one yard and an half in length, and moderately broad and thick; if thick, an eye may be made at one end of it, by doubling about two inches and ſewing it ſtrongly; and the other end paſſed through this doubling, in order to make the nooſe; which being mounted upon the thumb and fingers of his hand, muſt be introduced, and gently ſlipped over the toes and feet of the child ſo as to embrace the ancles, and thus applied it muſt be drawn tight with his other hand.

If the foot or feet ſhould be ſo ſlippery, that his fingers cannot hold them, and work over the nooſe at the ſame time, it muſt be withdrawn and mounted round his hand or wriſt; with which hand, when introduced, he may take firm hold on both feet, if they are as far down as the vagina; then with the fingers of his other hand, he can ſlide the nooſe along the hand and fingers that hold the feet, and fix it round the ancle: but if one foot remains within the uterus, the fingers of his other hand cannot puſh up the nooſe far enough to ſlide it over the ancle; ſo that he muſt have recourſe to a director, like that for polypuſes, mounted with the nooſe, which will puſh it along the hand and fingers that hold the foot. The nooſe being thus ſlipped over the fingers upon the ancle, he muſt pull the extremity of the fillet which hath paſſed the eye at the upper end of the director, and after it is cloſe drawn, bring down the inſtrument.

If the fillet or garter is too narrow or thin, let it be doubled in the middle, and the nooſe made by paſſing the two ends through the doubling.

When the belly preſents, and the head, ſhoulders, breech, thighs, and legs, are turned up over the back to the fundus uteri; when the back preſents, and all theſe parts are upwards; when the ſide preſents, with the head, ſhoulders, breech, thighs and legs turned to the ſide, back, or fore part of the uterus: In all theſe caſes, when the child is preſſed into a round, or (more properly) an oval figure, it may be, for the moſt part, moved round, with one hand introduced into the uterus, the head and ſhoulders puſhed to the fundus, and the legs and breech to the os internum; which being effected, the legs are eaſily brought down. See Plate CXIII. fig. 4. But theſe caſes are more or leſs difficult as the feet are farther up, or lower down, becauſe the buſineſs is to bring them downwards.

When the breaſt, ſhoulders, neck, ear, or face preſent to the os internum, the breech, thighs, and legs being towards the fundus, with the fore parts of the fœtus turned either to the ſide, back, or fore-part of the woman's belly; and the whole lying in a longiſh form, the uterus being cloſely contracted around its body like a ſheath; let the accoucheur introduce his hand into the vagina, and open the os internum by puſhing up the fingers and hand flattened between the parts that preſent and the inſide of the membranes; and reſt his hand in that ſituation, until he can diſtinguiſh how the child lies, and form a right judgment how to turn and deliver; for, if theſe circumſtances are not maturely conſidered, he will begin to work in a confuſed manner, fatigue himſelf and the patient, and find great difficulty in turning and extracting the child.

If the feet and legs of the fœtus lie towards the back, ſides, or fundus uteri, the woman ought to be laid on her back, with her breech raiſed and brought a little over the bed, as formerly obſerved; becauſe, in that poſition he can more eaſily reach the feet than in any other.

If they lie towards the fore-part of the uterus, eſpecially when the belly is pendulous, ſhe ought to lie upon her ſide; becauſe in the other poſture, it is often difficult to turn the hand up to the fore-part of the womb; whereas, if ſhe is laid on the left ſide, the right hand may be introduced at the upper part and left ſide of the brim of the pelvis, where it is wideſt, and then along the fore-part of the uterus, by which means the feet are more eaſily come at. If it is more convenient for the accoucheur to uſe his left hand, the patient may be turned on her right ſide. The only inconvenience attending theſe poſitions, is, that the woman cannot be kept ſo firm and ſteady, but will be apt to toſs about and ſhrink from the operator: and beſides, there may be a neceſſity for turning her upon her back, after the body is delivered, before he can extract the head, eſpecially if it be large, or the pelvis narrow.

The ſituation of the child being known, and the poſition of

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of the mother adjuſted, let the proper hand be introduced, and the firſt effort always made in puſhing the preſenting part up towards the fundus, either along the ſides, back, or fore part of the uters, as is moſt convenient. If this endeavour ſucceeds, and the breech, thighs, or legs come down, the body may be delivered with eaſe: but if the head, ſhoulder, breaſt, or neck preſent, the other parts of the body being ſtretched up lengthways, and the uterus ſo ſtrongly contracted around the child, that the preſenting part cannot be raiſed up, or, though puſhed upwards, immediately returns before the legs can be properly ſeized or brought down; the operator ought, in that caſe, to force up his hand ſlowly and gradually between the uterus and the child: if the reſiſtance is great, let him reſt a little, between whiles, in order to ſave the ſtrength of his hand and arm, and then proceed with his efforts until he ſhall advance his hand as far as the feet; for the higher his hand is puſhed, the more will the uterus be ſtretched, and the more room granted for bringing the legs along: and if, in puſhing up his hand, the fingers ſhould be entangled in the navel-ſtring or one of the arms, let him bring it a little lower, and paſs it up again on the outſide of ſuch incumbrance.

The hand being advanced as high as the fundus, let him, after ſome pauſe, feel for the breech, ſlide his fingers along the thighs in ſearch of the legs and feet; of which taking hold with his whole hand, if poſſible, let him bring them down either in a ſtreight line or with a half turn: or ſhould the contraction of the uterus be ſo ſtrong, that he cannot take hold of them in that manner, let him ſeize one or both ancles between his fingers, and pull them along; but if he cannot bring them down to the lower part of the uterus, ſo as to apply the nooſe, he muſt try again to puſh up the body, in order ſtill more to ſtretch the uterus, and obtain freer ſcope to bring them down lower: then he may apply the nooſe, and turn the child as above directed, until the head and ſhoulders are raiſed up to the fundus, and the feet and breech delivered.

If one leg only can be brought down, the child being turned, and that member extracted through the os externum, let the accoucher ſlide his hand up to fetch the other; but, if this cannot be done, he muſt fix a finger on the outſide of the groin of that thigh which is folded up along the belly, and bring along that buttock, as in the breech caſe, while he pulls with his other hand at the other leg; and the body being thus advanced, deliver as before directed.

When the ſhoulder preſents, and the arm lies double in the vagina, let him puſh them both up; but, if this cannot be done, and the hand is prevented from paſſing along, he muſt bring down the arm, and hold it with one hand, while the other is introduced; then let go and puſh up the ſhoulder, and as the child is turned, and the feet brought down, the arm will for the moſt part return into the uterus: but if the arm that is come down, be ſo much ſwelled, that it is impracticable to introduce the hand, ſo as to turn and deliver the child, he muſt ſeparate it at the joint of the ſhoulder, if it be ſo low down; or at the elbow, if he cannot reach the ſhoulder. If the limb be much mortified, it may be twiſted off; otherwiſe, it may be ſnipt and ſeparated with the ſciſſars.

If the ſhoulder, by the imprudence and ignorance of the unſkilful, who pull, in expectation of delivering in that way, is forced into the vagina, and part of it appears on the outſide of the os externum, a vaſt force is required to return it into the uterus; becauſe, in this caſe, the ſhoulder, part of the ribs, breaſt, and ſide, are already pulled out of the uterus, which muſt be extended ſo as not only to receive them again, but alſo to admit the hand and arm of the accoucheur. If this diſtenſion cannot poſſibly be effected, he muſt fix a crotchet above the ſternum, and turn the child by puſhing up the ſhoulder and pulling down with the crotchet; or ſlide his fingers to the neck of the child, and with the ſciſſars divide the head from the body; then deliver firſt the ſeparated head, or bring along the body by pulling at the arm, or, if need be, with the aſſiſtance of the crotchet.

When the forehead, face, or ear preſents, and cannot be altered with the hand into the natural poſition; or is not advanced to the os externum, ſo as that we can aſſiſt with the forceps; the head muſt be returned, and the child delivered by the feet: but if this cannot be done, and the woman is in imminent danger, recourſe muſt be had to the crotchet.

If the navel-ſtring comes down by the child's head, and the pulſation is felt in the arteries, there is a neceſſity for turning without loſs of time; for unleſs the head advances faſt, and the delivery is quick, the circulation in the veſſels will be entirely obſtructed, and the child conſequently periſh. If the head is low in the pelvis, the forceps may be ſucceſsfully uſed.

No doubt, if the pelvis is very narrow, or the head too large, it would be wrong to turn: in that caſe, we ought to try if we can poſſibly raiſe the head, ſo as to reduce the funis above it, and after that let the labour go on: but, if the waters are all gone, and a large portion of the funis falls down, it is impoſſible to raiſe it, ſo as to keep it up, even although we could eaſily raiſe the head; becauſe, as one part of the funis is puſhed up with the fingers, another part falls down, and evades the reduction; and to raiſe it up to the ſide, and not above the head, will be to no purpoſe; when a little only jets down at the ſide of the head, our endeavours will, for the moſt part, be ſucceſsful.

The ancients, as well as ſome of the moderns, adviſe, in all caſes when the upper parts, ſuch as the ſhoulders, breaſt, neck, face, or ear of the child preſent, to puſh them upwards, and bring in the head as in the natural way; obſerving, that the fœtus ought never to be delivered by the feet, except in the preſentation of the lower parts, ſuch as the ſmall of the back, belly, ſide, breech, or legs. Were it practicable at all times to bring the head into the right poſition, a great deal of fatigue would be ſaved to the operator, much pain to the woman, and imminent danger to the child: he therefore ought to attempt this method, and may ſucceed when he is called before the membranes are broke, and feels, by the touch, that the face, ear, or any of the upper parts, preſents; in that caſe, let him open the os externum ſlowly during every pain, and when the os internum is ſufficiently dilated by the deſcent of the waters and membranes, let him introduce his hand into the uterus, as before directed, betwixt the womb and the membranes, which muſt be broke;

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broke; and if he finds the head ſo large, or the pelvis ſo narrow, that it will be difficult to ſave the child; provided the woman is vigorous and has ſtrong pains, he may with little difficulty bring in the crown of the head, then withdraw his hand; and if the pains return and continue, the child has a good chance to be delivered alive. Even after the membranes are broke, if the preſenting part hath ſo locked up the os internum, as to detain ſome portion of the waters (a circumſtance eaſily known in puſhing up the part that preſents,) he may run up his hand ſpeedily to keep them from being diſcharged, and act in the ſame manner: but if the child is not large, nor the pelvis narrow, it were pity, while his hand is in the uterus, to deſiſt from turning the child and bringing it by the feet; becauſe, in that caſe, he may be pretty certain of ſaving it. Beſides, after the head is brought into the right poſition, ſhould the pains go off entirely, (and this frequently happens,) or a flooding come one, in conſequence of the force which hath been exerted, he will find great difficulty in turning after the waters have been diſcharged; for, it is harder to turn when the vertex preſents, than in any other poſition; whereas, in the caſe of a large head or narrow pelvis, when the head is forced down by the labour-pains, and will not farther advance, the child may be ſaved by the forceps; nay, though the pains do not act ſo as to force it down, to be delivered either by the forceps or in the natural way, the head may be opened and extracted with the crotchet, which is the laſt reſource.

But this neceſſity ſeldom occurs, becauſe the caſes in which we are moſt commonly called, are after the membranes have been long broke, the waters diſcharged, and the uterus ſtrongly contracted around the body of the child, which it confines, as it were, in a mould: ſo that it is next to impoſſible to bring the head into the natural poſition; for this cannot be effected without firſt puſhing up the part that preſents, for which purpoſe great force is required; and as one hand only can be introduced, when the operator endeavours to bring in the head, the puſhing force is abated, to allow the pulling force to act; and the parts that hindered the head from preſenting are again forced down: beſides, the head is ſo large and ſlippery, that he can obtain no firm hold. He might, indeed, by introducing a finger into the mouth, lay hold of the under jaw, and bring in the face, provided the ſhoulder preſents; but, inſtead of amending, this would make the caſe worſe, unleſs the child be very ſmall: yet, granting the head could be brought into the natural poſition, the force neceſſarily exerted for this purpoſe would produce a flooding, which commonly weakens the patient, and carries off the pains; and after all, he muſt turn with leſs advantage: and if that cannot be performed when the head is brought in, he muſt have recourſe to the laſt and moſt diſagreeable method; whereas when any other part preſents, we can always turn the child, and deliver it by the feet. This we cannot promiſe after the head is brought in; and once the operator's hand is in the uterus, he ought not to run ſuch riſks.

The child is often in danger, and ſometimes loſt, when the breech preſents, and is low down in the pelvis, provided the thighs are ſo ſtrongly preſſed againſt the funis and belly, as to ſtop the circulation in the rope; as alſo when the child is detained by the head, after the body is delivered: in both caſes, the danger muſt be obviated by an expeditious delivery; and if the body is entangled in the navel-ſtring, it muſt be diſengaged as well as poſſible, eſpecially when the funis happens to be between the thighs.

The legs and breech of the child being brought down, and the body properly turned with the fore-parts to the mother's back, let the accoucheur endeavour to bring it along; but, if it is detained by the ſize of the belly, diſtended with air or water, (a caſe that frequently happens when the child has been dead for ſeveral days,) let the belly be opened, by forcing into it the points of his ſciſſars; or, he may tear it open with the ſharp crotchet.

The body of the child being delivered, the arms brought down, and every method hitherto directed unſucceſsfully uſed for the extraction of the head, which is detained by being naturally too large, over oſſified, or dropſical, or from the narrowneſs and diſtortion of the pelvis; if the belly was not opened, and the child is found to be alive by the motion of the heart, or pulſation of the arteries in the funis, the forceps ought to be tried; but, if he finds it impracticable to deliver the head, ſo as to ſave the life of the child, he muſt, according to ſome, force the points of the ſciſſars through the lower part of the occipital bone, or through the foramen magnum; then dilate the blades, ſo as to enlarge the opening, and introduce a blunt or ſharp hook. This operation rarely ſucceeds when the head is over-oſſified; but may anſwer the purpoſe when the bones are ſoft and yielding; or in the caſe of an hydrocephalus: becauſe, in the firſt, the aperture may ſometimes be enlarged, and in the other the water will be evacuated ſo as to diminiſh the bulk of the head, which will, of conſequence, come along with more eaſe.

If, notwithſtanding theſe endeavours, the head cannot be extracted, let the operator introduce his hand along the head, and his fingers through the os uteri; then ſlide up one of the curved crotchets along the ear, betwixt his hand and the child's head, upon the upper part of which it muſt be fixed: this being done, let him withdraw his hand, take hold of the inſtrument with one hand, turning the curve of it over the forehead, and with the other graſp the neck and ſhoulders, then pull along. The crotchet being thus fixed on the upper part, where the bones are thin and yielding, makes a large opening, through which the contents of the ſkull are emptied, the head collapſing is with more certainty extracted, and the inſtrument hath a firm hold to the laſt, at the forehead, os petroſum, and baſis of the ſkull.

The excellency of *Meſnard*'s contrivance is more conſpicuous here than when the head preſents; becauſe the curvature of the crotchet allows the point to be fixed on the upper part of the ſkull, which is to be tore open; and in pulling, the contents are evacuated, and the head is leſſened: by theſe means, the principal obſtruction is removed. See Plate CXIII. fig. 8.

a, Repreſents a pair of curved crotchets locked together in the ſame manner as the forceps. The dotted lines along the inſide of one of the blades repreſent a ſheath contrived to guard the point till it is introduced

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duced high enough; the ligature at the handles marked with the two dotted lines is then to be untied, the ſheath withdrawn, and the point, being uncovered, is fixed as in Plate CXIII. fig. 5.

b, Gives a view of the back part of one of the crotchets, which is 12 inches long.

c, A front view of the point, to ſhew its proportional length and breadth.

d, The ſciſſars for perforating the cranium in very narrow and diſtorted pelvis's. They ought to be made very ſtrong, and at leaſt nine inches in length, with ſtops or reſts in the middle of the blades, by which a large dilatation is more eaſily made.

If one crotchet be found inſufficient, let him introduce the other in the ſame manner, along the oppoſite ſide, lock and join them together, and pull along, moving and turning the head, ſo as to humour the ſhape of the pelvis. This method ſeldom fails to accompliſh his aim, though ſometimes very great force is required; in which caſe, he muſt pull with leiſure and caution.

But if all theſe expedients ſhould fail, by reaſon of the extraordinary oſſification or ſize of the head, or the narrowneſs and diſtortion of the pelvis, after having uſed the crotchets without ſucceſs, he muſt ſeparate the body from the head with a biſtory or pair of ſciſſars; then puſhing up the head into the uterus, turn the face to the fundus, and the vertex down to the os internum and brim of the pelvis: let him direct an aſſiſtant to preſs upon the woman's belly with both hands, in order to keep the uterus and head firm in that poſition; then open the ſkull with the ſciſſars, deſtroy the ſtructure of the brain, and extract with the crotchets.

The head is ſometimes left in the uterus by thoſe practitioners, who not knowing how to turn the fore-parts and face of the child towards the back part of the uterus, or how to bring it along, although it preſented in that poſition, pull at random with all their ſtrength; ſo that the neck is ſtretched and ſeparated, and the head left behind. This may alſo happen to an expert accoucheur, when the child hath been dead for many days, and the body is much mortified, even though he hath uſed all the neceſſary precautions.

In ſuch a caſe, provided the head is not very large, nor the pelvis narrow, and the forehead is towards the ſacrum, let him ſlide up his hand along the back part of the pelvis, and introducing two fingers into the mouth, with the thumb below the chin, try to pull the forehead into the hollow of the ſacrum: if it ſticks at the jetting-in of that bone, he muſt endeavour to move it, firſt to one ſide, and then to the other. If the head is ſmall, it will come along; if any fragment of the neck remains, or any part of the looſe ſkin, he may lay hold on it, and aſſiſt delivery, by pulling at it with his other hand; if the head is low down, it may be extracted with the forceps.

Should all theſe methods fail, let him puſh up his hand along the ſide of the head, until it ſhall have paſſed the os internum; with the other hand, let him introduce one of the curved crotchets, and fix it upon the upper part of the head; then withdrawing the hand which was introduced, take hold on the inſtrument, and ſliding the fingers of the other hand into the mouth, he muſt pull down with both, as above directed. If the head is not over-oſſified, the crotchet will tear open the ſkull; and the bulk being of conſequence diminiſhed, the whole may be brought along, even in a narrow pelvis: but if it cannot be moved, even by this expedient, he muſt introduce the other crotchet along the other ſide of the head, and fixing it upon the ſkull, lock them together; then in pulling, turn the fore-head down into the hollow of the ſacrum, and extract with an half round turn upwards, as when delivering with the forceps.

If the forehead is towards the os pubis, and cannot be brought into the right poſition, let him with his hand puſh up the head into the uterus, turn the forehead from the anterior to the ſide or back part of it, and try to extract as before. If the child hath been dead ſome time, and is much mortified, he muſt pull cautiouſly at the under jaw, becauſe, ſhould that give way, he will have no other hold for pulling, or keeping the head ſteady when he attempts to extract with one crotchet.

When the head is ſo large, or the pelvis ſo narrow, that none of theſe methods will ſucceed, let him puſh up, and turning the upper parts downwards, direct an aſſiſtant to preſs the patient's belly with both hands, moving them from ſide to ſide, and ſqueezing in ſuch a direction as will force the head towards the os internum, and retain it firmly in that poſition; then it muſt be opened and extracted.

Although, by theſe means, you may ſucceed in a few caſes of this kind, yet as great difficulties may occur from inflammations of the pudenda, contraction of the uterus, ſlipperineſs or largeneſs of the head, and the narrowneſs of the pelvis, it will not be improper to inform the reader of other methods that appear to be uſeful. Let the hand be introduced into the vagina, and if it cannot be admitted within the uterus, the fingers being inſinuated, may move the head ſo as to raiſe the face and chin to the fundus, the vertex being turned to the os internum, and the forehead towards the ſide of the ſacrum. This being effected, let the operator ſlide up along one ear a blade of the long forceps, which are curved to the ſide; then change hands, and ſend up the other blade along the oppoſite ear: when they are locked, and the handles ſecured by a fillet, he muſt pull the head as low as it will come; then putting them into the hands of an aſſiſtant, who will keep them in that poſition, let him make a large opening with the ſciſſars, ſqueeze the head with great force, and extract ſlowly and by degrees.

Having turned down the vertex, as above directed, let *Leverot*'s tire-tête, with the three ſides joined together, be introduced along the accoûcheur's hand to the upper part of the head; then let the ſides or blades be opened with the other hand, ſo as to incloſe the head, moving them circularly and lengthwiſe in a light and eaſy manner, that they may paſs over the inequalities of the ſcalp, and avoid the reſiſtance of the head and uterus: when they are exactly placed at equal diſtances from one another, let him join the handles, withdraw his hand, and tying them together with a fillet, pull down, open, and extract, as above directed; and let it be remembered, that the farther the hand can be introduced into the uterus, the more eaſily will both inſtruments be managed.

When

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When the pelvis is large, or the head ſmall, (in which caſes this misfortune ſeldom happens,) without doubt we might ſucceed with *Mauriceau*'s broad fillet or ſling, provided it could be properly applied,

When the head is ſmall, or the pelvis large, dilating the foramen magnum with the ſciſſars, and introducing the blunt hook, may be of uſe either to pull the head along, or keep it down until we can fix the forceps, curve crotchet, or *Leveret*'s tire-tête.

Of Twins.

Twins are ſuppoſed to be the effect of a double conception in one coition, when two or more ova are impregnated with as many animalcula; which deſcending from the ovarium, through the Fallopian tube, into the fundus uteri, as they increaſe, come in contact with that part, and with one another, and are ſo preſſed as to form one globular figure, and ſtretch the womb into the ſame form which it aſſumes when diſtended by one ovum only; and that during the whole term of uterine geſtation, it is impoſſible to diſtinguiſh twins, either by the figure and magnitude of the uterus, or by the motion of the different fœtuſſes; for one child, when it is large, and ſurrounded with a great quantity of waters, will ſometimes produce as large a prominence (or even larger) in the woman's belly, than is commonly obſerved when ſhe is big with twins. One child will alſo, by moving its legs, arms, and other parts of its body, againſt different parts of the uterus, at the ſame inſtant, or by intervals, yield the ſame ſenſation to the mother, as may be obſerved in two or more children; for part of the motion in twins is employed on each other, as well as upon the uterus.

There is therefore no certain method of diſtinguiſhing in theſe caſes, until the firſt child is delivered, and the accoucheur has examined if the placenta is coming along. If this comes of itſelf, and after its extraction the mouth of the womb be felt contracted, and the operator is unwilling to give unneceſſary pain by introducing his hand into the uterus; let him lay his hand upon the woman's abdomen, and if nothing is left in the womb, he will generally feel it juſt above the os pubis, contracted into a firm round ball of the ſize of a child's head, or leſs: whereas, if there is another child left, the ſize will be found much larger. If the placenta does not come down before the ſecond child, which is frequently the caſe, upon examining, he will commonly feel the membranes with the waters puſhed down through the os uteri; or, if they are broke, the head or ſome part of the body will be felt. If, therefore, the woman has ſtrong pains, and is in no danger from floodings or weakneſs, provided the head preſents fair, and ſeems to come along, ſhe will be delivered of this alſo in the natural way.

If the membranes are not broke, if the head does not immediately follow, or if the child preſents wrong, he ought to turn and bring it immediately by the feet; in order to ſave the patient the fatigue of a ſecond labour, that may prove tedious, and even dangerous, by enfeebling her too much. Beſides, as the parts are fully opened by the firſt delivery, he can introduce his hand with eaſe; and as the membranes are, for the moſt part, whole, the waters may be kept up, and the fœtus eaſily turned; but, if the pelvis is narrow, the woman ſtrong, and the head preſents, he ought to leave it to the efforts of nature.

If the child preſents wrong, and, in turning that, he feels another, he muſt beware of breaking the membranes of one, while he is at work upon the other: but, ſhould they chance to be broke, and the legs of both entangled together, (though this is ſeldom the caſe, becauſe they are commonly divided by two ſets of membranes,) let the operator, when he has got hold on two legs, run up his fingers to the breech, and feel if they belong to the ſame body; and one child being delivered, let the other be turned and brought out in the ſame manner. If there are more than two, the ſame method muſt take place, in extracting one after another.

In caſe of twins, the placenta of the firſt ſeldom comes along, until the ſecond child is delivered; but, as this does not always happen, he ought, as formerly directed, to certify himſelf that there is nothing left in the uterus, when the cake comes of itſelf. Both children being delivered, let him extract both placentas, if they come not of themſelves; and if they form diſtinct cakes, ſeparate firſt one, then the other; but if they are joined together, forming but one maſs, they may be delivered at once.

When there are three or four children, (a caſe that rarely happens,) the placentas are ſometimes diſtinct, and ſometimes all together form but one round cake; but, when this is macerated in water for ſome days, they, with their ſeveral membranes, may be eaſily ſeparated from one another; for they only adhere in conſequence of their long preſſure in the uterus, and ſeldom have any communication of veſſels.

Twins for the moſt part lie diagonally in the uterus, one below the other; ſo that they ſeldom obſtruct one another at the os internum. See Plate CXI. fig. 5.

Of Monsters.

Two children joined together by their bellies, (which is the moſt common caſe of monſtrous births,) or by the ſides, or when the belly of the one adheres to the back of the other, having commonly but one funis, are comprehended in this claſs, and ſuppoſed to be the effect of two animalcula impregnating the ſame ovum, in which they grow together, and are nouriſhed by one navel-ſtring, originally belonging to the ſecundines; becauſe, the veſſels pertaining to the coats of the vein and arteries, do not anaſtomoſe with the veſſels belonging to the fœtus.

In ſuch a caſe, where the children were ſmall, the adheſion hath been known to ſtretch in pulling at the feet of one, ſo as to be delivered; and the other hath been afterwards brought along, in the ſame manner, without the neceſſity of a ſeparation.

When the accoucheur is called to a caſe of this kind, if the children are large, and the woman come to her full time, let him firſt attempt to deliver them by that method: but if, after the legs and part of the body of the firſt are brought down, the reſt will not follow, let him ſlide up his hand, and with his fingers examine the adheſion; then introducing the ſciſſars between his hand and the body of the fœtus, endeavour to ſeparate them by

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ſnipping through the juncture. Should this attempt fail, he muſt diminiſh the bulk in the beſt manner he can think of, and bring the body of the firſt, in different pieces, by pulling or cutting them aſunder, as he extracts with the help of the crotchet.

No certain rules can be laid down in theſe caſes, which ſeldom happen; and therefore a great deal muſt be left to the judgment and ſagacity of the operator, who muſt regulate his conduct according to the circumſtances of the caſe, and according to the directions given for delivering, when the pelvis is narrow and the children extraordinary large.

Of the Cæsarian Operation.

When a woman cannot be delivered by any of the methods hitherto deſcribed and recommended in laborious and preternatural labours, on account of the narrowneſs or diſtortion of the pelvis, into which it is ſometimes impoſſible to introduce the hand; or from large excreſcences and glandular ſwellings, that fill up the vagina, and cannot be removed; or from large cicatrices and adheſions in that part, and at the os uteri, which cannot be ſeparated; in ſuch emergencies, if the woman is ſtrong, and of a good habit of body, the Cæſarian operation is certainly adviſeable, and ought to be performed; becauſe the mother and child have no other chance to be ſaved, and it is better to have recourſe to an operation which hath ſometimes ſucceeded, than leave them both to inevitable death. Nevertheleſs, if the woman is weak, exhauſted with fruitleſs labour, violent floodings, or any other evacuation, which renders her recovery doubtful, even if ſhe were delivered in the natural way: in theſe circumſtances it would be raſhneſs and preſumption to attempt an operation of this kind, which ought to be delayed until the woman expires, and then immediately performed, with a view to ſave the child.

The operation hath been performed both in this and the laſt century, and ſometimes with ſuch ſucceſs, that the mother has recovered, and the child ſurvived. The previous ſteps to be taken, are to ſtrengthen the patient, if weak, with nouriſhing broths and cordials; to evacuate the indurated fæces with repeated glyſters; and, if the bladder is diſtended with urine, to draw it off with a catheter. Theſe precautions being taken, ſhe muſt be laid on her back, on a couch or bed, her ſide on which the inciſion is to be made being raiſed up by pillows placed below the oppoſite ſide: the operation may be performed on either ſide, though the left is commonly preferred to the right; becauſe, in this laſt, the liver extends lower. The apparatus conſiſts of a biſtory, probe-ſciſſars, large needles threaded, ſpunges, warm water, pledgets, a large tent or doſſil, compreſſes, and a bandage for the belly.

If the weather is cold, the patient muſt be kept warm, and no part of the belly uncovered, except that on which the inciſion is to be made: if the operator be a young practitioner, the place may be marked by drawing a line along the middle ſpace between the navel and the os ilium, about ſix or ſeven inches in length, ſlanting forwards towards the left groin, and beginning as high as the navel.

According to this direction, let him hold the ſkin of the abdomen tenſe between the finger and thumb of one hand, and, with the biſtory in the other, make a longitudinal inciſion through the cutis, to the membrana adipoſa, which, with the muſcles, muſt be ſlowly diſſected and ſeparated, until he reaches the peritonæum, which muſt be divided very cautiouſly, for fear of wounding the inteſtines that frequently ſtart up at the ſides, eſpecially if the membranes are broke, the waters diſcharged, and the uterus contracted.

The peritonæum being laid bare, it may either be pinched up by the fingers, or ſlowly diſſected with the biſtory, until an opening is made ſufficient to admit the fore-finger, which muſt be introduced as a director for the biſtory or ſciſſars in making an effectual dilatation. If the inteſtines puſh out, let them be preſſed downwards, ſo as that the uterus may come in contact with the opening. If the womb is ſtill diſtended with the waters, and at ſome diſtance from the child, the operator may make upon it a longitudinal inciſion at once; but if it is contracted cloſe round the body of the fœtus, he muſt pinch it up, and dilate in the ſame cautious manner practiſed upon the peritonæum, taking care to avoid wounding the Fallopian tubes, ligaments, and bladder: then introducing his hand, he may take out the child and ſecundines. If the woman is ſtrong, the uterus immediately contracts, ſo as that the opening, which at firſt extended to about ſix or ſeven inches, is reduced to two, or leſs; and in conſequence of this contraction, the veſſels being ſhrunk up, a great effuſion of blood is prevented.

The coagulated blood being removed, and what is ſtill fluid ſponged up, the inciſion in the abdomen muſt be ſtitched with the interrupted ſuture, and ſufficient room left between the laſt ſtitch and the lower end of the opening, for the diſcharge of the moiſture and extravaſated fluid. The wound may be dreſſed with dry pledgits or doſſils dipped in ſome liquid balſam warmed, covered with compreſſes moiſtened with wine, and a bandage to keep on the dreſſings and ſuſtain the belly. Some authors obſerve, that the cutis and muſcles only ſhould be taken up in the ſuture, leſt bad ſymptoms ſhould ariſe from ſtitching the peritonæum.

The woman muſt be kept in bed, as quiet as poſſible, and every thing adminiſtered to promote the lochia, perſpiration, and ſleep: which will prevent a fever and other dangerous ſymptoms. If ſhe hath loſt a great quantity of blood from the wounds in the uterus and abdomen, ſo as to be in danger from inanition, broths, caudles, and wine, ought to be given in ſmall quantities, and frequently repeated; and the Peruvian bark adminiſtered in powder, decoction, or extract, may be of great ſervice in this caſe.

Of the management of women from the time of their delivery to the end of the month, with the ſeveral diſeaſes to which they are ſubject during that period.

Of the External Application.

The woman being delivered of the child and placenta, let a ſoft linen cloth, warmed, be applied to the external parts; and if ſhe complains much of a ſmarting ſoreneſs, ſome pomatum may be ſpread upon it. The linen that

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that was laid below her, to ſponge up the diſcharges, muſt be removed, and replaced with others that are clean, dry, and warm. Let her lie on her back, with her legs extended cloſe to each other; or upon her ſide, if ſhe thinks ſhe can lie eaſier in that poſition, until ſhe recovers from the fatigue: if ſhe is ſpent and exhauſted, let her take a little warm wine or caudle, or, according to the common cuſtom, ſome nutmeg and ſugar grated together in a ſpoon: the principal deſign of adminiſtring this powder, which among the good women is ſeldom neglected, is to ſupply the want of ſome cordial draught, when the patient is too weak to be raiſed, or ſuppoſed to be in danger of reachings from her ſtomach's being overloaded. When ſhe hath in ſome meaſure recovered her ſtrength and ſpirits, let the cloths be removed from the parts, and others applied in their room; and, if there is a large diſcharge from the uterus, let the wet linen below her be alſo ſhifted, that ſhe may not run the riſque of catching cold.

When the patient is either weak or faintiſh, ſhe ought not to be taken out of bed, or even raiſed up to have her head and body ſhifted, until ſhe is a little recruited; otherwiſe ſhe will be in danger of repeated faintings, attended with convulſions, which ſometimes end in death. To prevent theſe bad conſequences, her ſkirt and petticoats ought to be looſened and pulled down over the legs, and replaced by another well warmed, with a broad headband to be ſlipt in below, and brought up over her thighs and hips: a warm double cloth muſt be laid on the belly, which is to be ſurrounded by the head band of the ſkirt pinned moderately tight over the cloth, in order to compreſs the viſcera and the relaxed parietes of the abdomen, more or leſs, as the woman can eaſily bear it; by which means the uterus is kept firm in the lower part of the abdomen, and prevented from rolling from ſide to ſide when the patient is turned: but the principal end of this compreſſion, is to hinder too great a quantity of blood from ruſhing into the relaxed veſſels of the abdominal contents; eſpecially when the uterus is emptied all of a ſudden, by a quick delivery. The preſſure being thus ſuddenly removed, the head is all at once robbed of its proportion of blood, and the immediate revulſion precipitates the patient into dangerous lypothymia.

For this reaſon the belly ought to be firmly compreſſed by the hands of an aſſiſtant, until the bandage is applied; or, in lieu of it, a long towel, ſheet, or roller, to make a ſuitable compreſſion: but, for this purpoſe, different methods are uſed in different countries, or according to the different circumſtances of the patients. The headcloaths and ſhift ought alſo to be changed, becauſe with ſweating in time of labour they are rendered wet and diſagreeable. Several other applications are neceſſary, when the external or internal parts are rent or inflamed, misfortunes that ſometimes happen in laborious and preternatural caſes. See MEDICINE, p. 165, 166.

Of Air, Diet, Sleeping and Watching, Motion and Reſt, Retention and Excretion, and the Paſſions of the Mind.

ALTHOUGH we cannot remove the patient immediately after delivery into another climate, we can qualify the air, ſo as to keep it in a moderate and ſalutary temper, by rendering it warm or cold, moiſt or dry, according to the circumſtances of the occaſion. With regard to diet, women in time of labour, and even till the ninth day after delivery, ought to eat little ſolid food, and none at all during the firſt five or ſeven: let them drink plentifully of warm diluting fluids, ſuch as barley-water, gruel, chicken water, and teas; caudles are alſo commonly uſed, compoſed of water gruel boiled up with mace and cinnamon, to which, when ſtrained, is added a third or fourth part of white wine, or leſs, if the patient drinks plentifully, ſweetened with ſugar to their taſte: this compoſition is termed white caudle; whereas, if ale is uſed inſtead of wine, it goes under the name of brown caudle. In ſome countries, eggs are added to both kinds; but, in that caſe, the woman is not permitted to eat meat or broths till after the fifth or ſeventh day: in this country, however, as eggs are no part of the ingredients, the patient is indulged with weak broth ſooner, and ſometimes allowed to eat a little boiled chicken. But all theſe different preparations are to be preſcribed weaker or ſtronger, with regard to the ſpices, wine, or ale, according to the different conſtitutions and ſituations of different patients: for example, if ſhe is low and weak, in conſequence of an extraordinary diſcharge of any kind, either before or after delivery, or if the weather is cold, the caudles and broths may be made the ſtronger; but if ſhe is of a full habit of body, and has the leaſt tendency to a fever, or if the ſeaſon is exceſſively hot, theſe drinks ought to be of a very weak conſiſtence, or the patient reſtricted to gruel, tea, barley and chicken water, and theſe varied according to the emergency of the caſe.

Her food muſt be light and eaſy of digeſtion, ſuch as panada, biſcuit, and ſago; about the fifth or ſeventh day ſhe may eat a little boiled chicken, or the lighteſt kind of young meat: but, theſe laſt may be given ſooner or later, according to the circumſtances of the caſe, and the appetite of the patient. In the regimen as to eating and drinking, we ſhould rather err on the abſtemious ſide, than indulge the woman with meat and ſtrong fermented liquors, even if theſe laſt ſhould be moſt agreeable to her palate: for we find by experience, that they are apt to increaſe or bring on fevers, and that the moſt nouriſhing and ſalutary diet is that which we have above preſcribed. Every thing that is difficult of digeſtion, or quickens the circulating fluids, muſt of neceſſity promote a fever; by which, the neceſſary diſcharges are obſtructed, and the patient's life endangered.

As to the article of ſleeping and watching, the patient muſt be kept as free from noiſe as poſſible, by covering the floors and ſtairs with carpets and cloths, oiling the hinges of the doors, ſilencing the bells, tying up the knockers, and in noiſy ſtreets ſtrowing the pavement with ſtraw; if, notwithſtanding theſe precautions, ſhe is diſturbed, her ears muſt be ſtuffed with cotton, and opiates adminiſtred to procure ſleep; becauſe watching makes her reſtleſs, prevents perſpiration, and promotes a fever.

Motion and reſt are another part of the nonnaturals to which we ought to pay particular regard. By toſſing about, getting out of bed, or ſitting up too long, the perſpiration is diſcouraged and interrupted; and in this laſt attitude

attitude the uterus, not yet fully contracted, hangs down, ſtretching the ligaments, occaſioning pain, cold ſhiverings, and a fever: for the prevention of theſe bad ſymptoms, the patient muſt be kept quiet in bed till after the fourth or fifth day, and then be gently lifted up in the bed-cloaths, in a lying poſture, until the bed can be adjuſted, into which ſhe muſt be immediately re-conveyed, there to continue for the moſt part, till the ninth day, after which period women are not ſo ſubject to fevers, as immediately after delivery. Some there are, who, from the nature of their conſtitutions, or other accidents, recover more ſlowly; and ſuch are to be treated with the ſame caution after, as before, the ninth day, as the caſe ſeems to indicate: others get up, walk about, and recover, in a much ſhorter time; but theſe may ſome time or other pay dearly for their foolhardineſs, by encouraging dangerous fevers: ſo that we ought rather to err on the ſafe ſide, than run any riſque whatſoever.

What next comes under conſideration, is the circumſtance of retention and excretion. We have formerly obſerved, that in time of labour, before the head of the child is locked into the pelvis, if the woman has not had eaſy paſſage in her belly that ſame day, the rectum and colon ought to be emptied by a glyſter, which will aſſiſt the labour, prevent the diſagreeable excretion of the fœces before the child's head, and enable the patient to remain two or three days after, without the neceſſity of going to ſtool. However, ſhould this precaution be neglected, and the patient very coſtive after delivery, we muſt beware of throwing up ſtimulating glyſters, or adminiſtring ſtrong cathartics, leſt they ſhould bring on too many looſe ſtools, which, if they cannot be ſtopt, ſometimes produce fatal conſequences, by obſtructing the perſpiration and lochia, and exhauſting the woman, ſo as that ſhe will die all of a ſudden; a cataſtrophe which hath frequently happened from this practice. Wherefore, if it be neceſſary to empty the inteſtines, we ought to preſcribe nothing but emollient glyſters, or ſome very gentle opener, ſuch as manna, or *Elect. Lenitivum*. But no excretion is of more conſequence to the patient's recovery, than a free perſpiration; which is ſo abſolutely neceſſary, that unleſs ſhe has a moiſture continually on the ſurface of her body, for ſome days after the birth, ſhe ſeldom recovers to advantage: her health, therefore, in a great meaſure depends upon her enjoying undiſturbed repoſe, and a conſtant breathing ſweat, which prevents a fever, by carrying off the tenſion, and aſſiſts the equal diſcharge of the lochia: and when theſe are obſtructed, and a fever enſues with pain and reſtleſſneſs, nothing relieves the patient ſo effectually as reſt and profuſe ſweating, procured by opiates and ſudorifics at the beginning of the complaints; yet theſe laſt muſt be more cautiouſly preſcribed in exceſſive hot than in cool weather.

The laſt of the nonnaturals to be conſidered are the paſſions of the mind, which alſo require particular attention. The patient's imagination muſt not be diſturbed by the news of any extraordinary accident which may have happened to her family or friends: for ſuch information hath been known to carry off the labour-pains entirely, after they were begun, and the woman has ſunk under her dejection of ſpirits: and even after delivery, theſe unſeaſonable communications have produced ſuch anxiety as obſtructed all the neceſſary excretions, and brought on a violent fever and convulſions, that ended in death.

Of violent Floodings.

All women, when the placenta ſeparates, and after it is delivered, loſe more or leſs red blood, from the quantity of half a pound, to that of one pound, or even two; but ſhould it exceed this proportion, and continue to flow without diminution, the patient is in great danger of her life: this hazardous hæmorrhage is known by the violence of the diſcharge, wetting freſh cloths as faſt as they can be applied; from the pulſe becoming low and weak, and the countenance turning pale; then the extremities grow cold, ſhe ſinks into faintings, and, if the diſcharge is not ſpeedily ſtopt, or diminiſhed, is ſeized with convulſions, which often terminate in death.

This dangerous efflux is occaſioned by every thing that hinders the emptied uterus from contracting, ſuch as great weakneſs and laſſitude, in conſequence of repeated floodings before delivery; the ſudden evacuation of the uterus; ſometimes, though ſeldom, it proceeds from part of the placenta's being left in the womb; it may happen when there is another child, or more, ſtill undelivered; when the womb is kept diſtended with a large quantity of coagulated blood; or when it is inverted, by pulling too forcibly at the placenta.

In this caſe, as there is no time to be loſt, and internal medicines cannot act ſo ſuddenly as to anſwer the purpoſe, we muſt have immediate recourſe to external application. If the diſorder be owing to weakneſs, by which the uterus is diſabled from contracting itſelf, ſo that the mouths of the veſſels are left open; or, though contracted a little, yet not enough to reſtrain the hœmorrhage of the thin blood; or if, in ſeparating the placenta, the accoucheur has ſcratched or tore the inner ſurface or membrane of the womb; in theſe caſes, ſuch things muſt be uſed as will aſſiſt the contractile power of the uterus, and hinder the blood from flowing ſo faſt into it and the neighbouring veſſels; for this purpoſe, cloths dipped in any cold aſtringent fluid, ſuch as oxycrate, or red tart wine, may be applied to the back and belly. Some preſcribe veneſection in the arm, to the amount of five or ſix ounces, with a view of making revulſion: if the pulſe is ſtrong, this may be proper; otherwiſe, it will do more harm than good. Others order ligatures, for compreſſing the returning veins at the hams, arms, and neck, to retain as much blood as poſſible in the extremities and head. Beſides theſe applications, the vagina may be filled with tow or linen rags, dipped in the above-mentioned liquids, in which a little allum, or ſachar-ſaturni hath been diſſolved: nay, ſome practitioners inject proof-ſpirits warmed, or, ſoaking them up in a rag or ſponge introduce and ſqueeze them into the uterus, in order to conſtringe the veſſels.

If the flooding proceeds from another child, the retention of the placenta, or coagulated blood, theſe ought immediately to be extracted; and if there is an inverſion of the uterus, it muſt be ſpeedily reduced. Should the hæmorrhage, by theſe methods abate a little, but ſtill continue to flow, though not in ſuch a quantity as to bring on ſudden death, ſome red wine and jelly ought to be

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be prescribed for the patient, who should take it frequently, and a little at a time; but above all things, chicken or mutton broths, administered in the same manner, for fear of overloading the weakened stomach, and occasioning reachings: these repeated in small quantities, will gradually fill the exhausted vessels, and keep up the circulation. If the pulse continues strong, it will be proper to order repeated draughts of barley-water, acidulated with elixir vitriol: but if the circulation be weak and languid, extract of the bark, dissolved in *aq. cinnamomi tenuis*, and given in small draughts, or exhibited in any other form, will be serviceable; at the same time, lulling the patient to rest with opiates. These, indeed, when the first violence of the flood is abated, if properly and cautiously used, are generally more effectual than any other medicine.

Of the After-pains.

After-pains commonly happen when the fibrous part of the blood is retained in the uterus or vagina, and formed into large clots, which are detained by the sudden contraction of the os internum and externum, after the placenta is delivered: or, if these should be extracted, others will sometimes be formed, though not so large as the first, because the cavity of the womb is continually diminishing after the birth. The uterus, in contracting, presses down these coagulums to the os internum; which being again gradually stretched, produces a degree of labour pains, owing to the irritation of its nerves: in consequence of this uneasiness, the woman squeezes the womb as in real labour; the force being increased, the clots are pushed along, and when they are delivered, she grows easy. The larger the quantity is of the coagulated blood, the severer are the pains, and the longer they continue.

Women in the first child seldom have after-pains; because, after delivery, the womb is supposed to contract, and push off the clots with greater force in the first than in the following labours: after-pains may also proceed from obstructions in the vessels, and irritations at the os internum. In order to prevent or remove these pains, as soon as the placenta is separated and delivered, the hand being introduced into the uterus, may clear it of all the coagula. When the womb is felt through the parietes of the abdomen larger than usual, it may be taken for granted, that there is either another child, or a large quantity of this clotted blood; and, which soever it may be, there is a necessity for its being extracted. If the placenta comes away of itself, and the after-pains are violent, they may be alleviated and carried off by an opiate: for, by sleeping and sweating plentifully, the irritation is removed, the evacuations are increased, the os uteri is insensibly relaxed, and the coagula slide easily along. When the discharge of the lochia is small, the after-pains, if moderate, ought not to be restrained; because the squeezing which they occasion, promotes the other evacuation, which is necessary for the recovery of the patient. After-pains may also proceed from an obstruction in some of the vessels, occasioning a small inflammation of the os internum and ligaments; and the squeezing thereby occasioned, may not only help to propel the obstructing fluid, but also (if not too violent) contribute to the natural discharges.

Of the Lochia.

We have already observed, that the delivery of the child and placenta is followed by an efflux of more or less blood, discharged from the uterus, which, by the immediate evacuation of the large vessels, is allowed to contract itself the more freely, without the danger of an inflammation, which would probably happen in the contraction, if the great vessels were not emptied at the same time: but, as the fluids in the smaller vessels cannot be so soon evacuated, or returned into the vena cava, it is necessary, that, after the great discharge is abated, a slow and gradual evacuation should continue, until the womb shall be contracted to near the same size which it had before pregnancy; and to this it attains about the eighteenth or twentieth day after delivery, though the period is different in different women.

When the large vessels are emptied immediately after delivery, the discharge frequently ceases for several hours, until the fluids in the smaller vessels are propelled into the larger, and then begins to flow again, of a paler colour.

The red colour of the lochia commonly continues till the fifth day, though it is always turning more and more serous from the beginning; but, about the fifth day, it flows off a clear, or sometimes (though seldom) of a greenish tint; for, the mouths of the vessels growing gradually narrower, by the contraction of the uterus, at last allow the serous part only to pass: as for the greenish hue, it is supposed to proceed from a dissolution of the cellular or cribriform membrane or mucus, that surrounded the surface of the placenta and chorion; part of which, being left in the uterus, becomes livid, decays, and, dissolving, mixes with and tinctures the discharge as it passes along.

Though the lochia, as we have already observed, commonly continue to the eighteenth or twentieth day, they are every day diminishing in quantity, and soonest cease in those women who suckle their children, or have had an extraordinary discharge at first; but the colour, quantity, and duration, differ in different women: in some patients, the red colour disappears on the first, or second day; and in others, though rarely, it continues more or less to the end of the month: the evacuation in some is very small, in others excessive: in one woman it ceases very soon, in another flows during the whole month: yet, all of these patients shall do well.

Some alledge, that this discharge from the uterus is the same with that from a wound of a large surface: but it is more reasonable to suppose, that the change of colour and diminution of quantity proceed from the slow contraction of the vessels; because, previous to pus, there must have been lacerations or imposthumes, and in women who have suddenly died after delivery no wound or excoriation hath appeared upon the inner surface of the womb, which is sometimes found altogether smooth, and at other times rough and unequal on that part to which the placenta adhered. The space that is occupied before delivery, from being six inches in diameter, or eighteen inches in circumference, will, soon after the birth, be contracted to one third or fourth of these dimensions.

Of

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Of the Milk Fever.

About the fourth day, the breaſts generally begin to grow turgid and painful. We have formerly obſerved, that, during the time of uterine geſtation, the breaſts in moſt women gradually increaſe till the delivery, growing ſofter as they are enlarged by the veſſels being more and more filled with fluids; and by this gradual diſtention they are prepared for ſecreting the milk from the blood, after delivery. During the two or three firſt days after parturition, eſpecially when the woman has undergone a large diſcharge, the breaſts have been ſometimes obſerved to ſubſide and grow flaccid; and about the third or fourth day, when the lochia begin to decreaſe, the breaſts ſwell again to their former ſize, and ſtretch more and more, until the milk, being ſecreted, is either ſucked by the child, or frequently of itſelf runs out at the nipples.

Moſt of the complaints incident to women after delivery, proceed either from the obſtruction of the lochia in the uterus, or of the milk in the breaſts, occaſioned by any thing that will produce a fever; ſuch as catching cold, long and ſevere labour, eating food that is hard of digeſtion, and drinking fluids that quicken the circulation of the blood in the large veſſels; by which means the ſmaller, with all the ſecretory and excretory ducts, are obſtructed.

The diſcharge of the lochia being ſo different in women of different conſtitutions, and beſides in ſome meaſure depending upon the method of management, and the way of life peculiar to the patient, we are not to judge of her ſituation from the colour, quantity, and duration of them, but from the other ſymptoms that attend the diſcharge; and if the woman ſeems hearty, and in a fair way of recovery, nothing ought to be done with a view to augment or diminiſh the evacuation. If the diſcharge be greater than ſhe can bear, it will be attended with all the ſymptoms of inanition; but as the lochia ſeldom flow ſo violently as to deſtroy the patient of a ſudden, ſhe may be ſupported by a proper nouriſhing diet, aſſiſted with cordial and reſtorative medicines. Let her, for example, uſe broths, jellies, and aſſes milk; if the pulſe is languid and ſunk, ſhe may take repeated doſes of the *confect. cardiac.* with mixtures compoſed of the cordial waters and volatile ſpirits: ſubaſtringents and opiates frequently adminiſtered, with the *cort. Peruvian.* in different forms, and auſtere wines, are of great ſervice. On the other hand, when the diſcharge is too ſmall, or hath ceaſed altogether, the ſymptoms are more dangerous, and require the contrary method of cure: for now the buſineſs is to remove a too great plenitude of the veſſels in and about the uterus, occaſioning tenſion, pain, and labour, in the circulating fluids; from whence proceed great heat in the part, reſtleſsneſs, fever, a full, hard, quick pulſe, pains in the head and back, nauſea, and difficulty in breathing. Theſe complaints, if not at firſt prevented, or removed by reſt and plentiful ſweating, muſt be treated with venæſection and the antiphlogiſtic method.

When the obſtruction is recent, let the patient lie quiet, and encourage a plentiful diaphoreſis, by drinking frequently of warm, weak, diluting fluids, ſuch as water-gruel, barley-water, tea, or weak chicken-broth.

Should theſe methods be uſed without ſucceſs, and the patient, far from being relieved by reſt, plentiful ſweating, or a ſufficient diſcharge of the obſtructed lochia, labour under an hot dry ſkin, anxiety, and a quick, hard, and full pulſe, the warm diaphoretics muſt be laid aſide; becauſe, if they fail of having the deſired effect, they muſt neceſſarily increaſe the fever and obſtruction, and recourſe be had to bleeding at the arm or ancle to more or leſs quantity, according to the degree of fever and obſtruction; and this evacuation muſt be repeated as there is occaſion. When the obſtruction is not total, it is ſuppoſed more proper to bleed at the ancle than at the arm; and at this laſt, when the diſcharge is altogether ſtopped. Her ordinary drink ought to be impregnated with nitre.

If ſhe is coſtive, emollient and gently opening glyſters may be occaſionally injected; and her breaſts muſt be fomented and ſucked, either by the mouth or pipe-glaſſes. If, by theſe means, the fever is abated, and the neceſſary diſcharges return, the patient commonly recovers; but, if the complaints continue, the antiphlogiſtic method muſt ſtill be purſued. If, notwithſtanding theſe efforts, the fever is not diminiſhed or removed by a plentiful diſcharge of the lochia from the uterus, the milk from the breaſts, or by a critical evacuation by ſweat, urine, or ſtool, and the woman is every now and then attacked with cold ſhiverings; an abſceſs or abſceſſes will probably be formed in the uterus or neighbouring parts, or in the breaſts; and ſometimes, the matter will be tranſlated to other ſituations, and the ſeat of it foretold from the part's being affected with violent pains: theſe abſceſſes are more or leſs dangerous, according to the place in which they happen, the largeneſs of the ſuppuration, and the good or bad conſtitution of the patient.

If when the pains in the epigaſtric region are violent, and the fever increaſed to a very high degree, the patient ſhould all of a ſudden enjoy a ceſſation from pain, without any previous diſcharge or critical emption, the phyſician may pronounce that a mortification is begun; eſpecially if, at the ſame time, the pulſe becomes low, quick, wavering, and intermitting: if the woman's countenance, from being florid, turns duſky and pale, while ſhe herſelf, and all the attendants, conceive her much mended; in that caſe, ſhe will grow delirious, and die in a very ſhort time.

What we have ſaid on this ſubject, regards that fever which proceeds from the obſtructed lochia, and in which the breaſts may likewiſe be affected: but the milk fever is that in which the breaſts are originally concerned, and which may happen though the lochia continue to flow in ſufficient quantity; nevertheleſs, they mutually promote each other, and both are to be treated in the manner already explained; namely, by opiates, diluents, and diaphoretics, in the beginning; and, theſe preſcriptions failing, the obſtructions muſt be reſolved by the antiphlogiſtic method deſcribed above. The milk-fever alone, when the uterus is not concerned, is not ſo dangerous, and much more eaſily relieved. Women of an healthy conſtitution, who ſuckle their own children, have good nipples,

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ples, and whoſe milk comes freely, are ſeldom or never ſubject to this diſorder, which is more incident to thoſe who do not give ſuck, and neglect to prevent the ſecretion in time; or, when the milk is ſecreted, take no meaſures for emptying their breaſts. This fever likewiſe happens to women who try too ſoon to ſuckle, and continue their efforts too long at one time; by which means, the nipples, and conſequently the breaſts, are often inflamed, ſwelled, and obſtructed.

In order to prevent too great a turgency in the veſſels of the breaſts, and the ſecretion of milk, in thoſe women who do not chuſe to ſuckle, it will be proper to make external application of thoſe things which by their preſſure and repercuſſive force will hinder the blood from flowing in too great quantity to this part, which is now more yielding than at any other time: for this purpoſe, let the breaſts be covered with *emp. de minio*, *diapalma*, or *emp. ſimp.* ſpread upon linen, or cloths dipped in camphorated ſpirits, be frequently applied to theſe parts and the armpits; while the patient's diet and drink is of the lighteſt kind, and given in ſmall quantities. Notwithſtanding theſe precautions, a turgency commonly begins about the third day; but by reſt, moderate ſweating, and the uſe of theſe applications, the tenſion and pain will ſubſide about the fifth or ſixth day, eſpecially if the milk runs out at the nipples: but if the woman catches cold, or is of a full habit of body, and not very abſtemious, the tenſion and pain increaſing, will bring on a cold ſhivering ſucceeded by a fever; which may obſtruct the other excretions, as well as thoſe of the breaſt.

In this caſe, the ſudorifics above recommended muſt be preſcribed; and if a plentiful ſweat enſues, the patient will be relieved; at the ſame time the milk muſt be extracted from her breaſts, by ſucking with the mouth or glaſſes: ſhould theſe methods fail, and the fever increaſe, ſhe ought to be blooded in the arm; and inſtead of the external applications hitherto uſed, emollient liniments and cataplaſms muſt be ſubſtituted, in order to ſoften and relax. If, in ſpite of theſe endeavours, the fever proceeds for ſome days, the patient is frequently relieved by critical ſweats, a large diſcharge from the uterus, miliary eruptions, or looſe ſtools mixed with milk, which is curdled in the inteſtines; but, ſhould none of theſe evacuations happen, and the inflammation continue with increaſing violence, there is danger of an impoſthume, which is to be brought to maturity, and managed like other inflammatory tumours; and no aſtringents ought to be applied, leſt they ſhould produce ſchirrhous ſwellings in the glands.

As the criſis of this fever, as well as of that laſt deſcribed, often conſiſts in miliary eruptions over the whole ſurface of the body, but particularly on the neck and breaſt, by which the fever is carried off, nothing ought to be given, which will either greatly increaſe or diminiſh the circulating force, but ſuch only as will keep out the eruptions. But if, notwithſtanding theſe eruptions, the fever, inſtead of abating, is augmented, it will be neceſſary to diminiſh its force, and prevent its increaſe, by thoſe evacuations we have mentioned above. On the contrary, ſhould the pulſe ſink, the eruptions begin to retreat inwardly, and the morbific matter be in danger of falling upon the viſcera, we muſt endeavour to keep them out, by opiates and ſudorific medicines; and here bliſters may be applied with ſucceſs.

Of the Evacuations neceſſary at the end of the Month after Delivery.

Thoſe who have had a ſufficient diſcharge of the lochia, plenty of milk, and ſuckle their own children, commonly recover with eaſe; and as the ſuperfluous fluids of the body are drained off at the nipples, ſeldom require evacuations at the end of the month: but if there are any complaints from fullneſs, ſuch as pains and ſtitches, after the twentieth day, ſome blood ought to be taken from the arm, and the belly gently opened by frequent glyſters, or repeated doſes of laxative medicines.

If the patient has tolerably recovered, the milk having been at firſt ſucked or diſcharged from the nipples, and afterwards diſcuſſed, no evacuations are neceſſary before the third or fourth week; and ſometimes not till after the firſt flowing of the menſes, which commonly happens about the fifth week; if they do not appear within that time, gentle evacuations muſt be preſcribed, to carry off the plethora, and bring down the catamenia.

MIL

MIGRATION, the paſſage or removal of a thing out of one place or ſtate into another.

MILAN, the capital of the Milaneſe, or dutchy of Milan, in Italy: E. long. 9° 30′, N. lat. 45° 25′.

MILBORN-port, a borough-town of Somerſetſhire, twenty-five miles ſouth of Bath. It ſends two members to parliament.

MILDEW, a diſeaſe happening to plants, cauſed by a dewy moiſture ſuppoſed by ſome to be a ſpecies of blight.

MILE, *mille paſſus*, a meaſure of length or diſtance, containing eight furlongs, *&c.*

The Engliſh ſtatute mile is fourſcore chains, or 1760 yards; that is, 5280 feet.

MIL

We ſhall here give a table of the miles in uſe among the principal nations of Europe, in geometrical paces, 60,000 of which make a degree of the equator.

	Geometrical paces.
Mile of Ruſſia	750
of Italy	1000
of England	1250
of Scotland and Ireland	1500
Old league of France	1500
The ſmall league, *ibid.*	2000
The mean league, *ibid.*	2500
The great league of France	3000
Mile of Poland	3000
of Spain	3248

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	Geometrical paces.
Mile of Germany	4000
of Denmark	5000
of Hungary	6000

MILFORD HAVEN, the moſt commodious harbour in Great Britain, ſituated in the ſouth weſt part of Pembrokeſhire in Wales, at the north entrance of the Briſtol channel.

MILIARY, in general, ſomething reſembling millet-ſeeds.

MILIARY FEVER. See MEDICINE, p. 73.

MILITANT, or CHURCH MILITANT, denotes the body of Chriſtians while here on earth.

MILITARY, ſomething belonging to the ſoldiery or militia.

MILITIA, in general, denotes the body of ſoldiers, or thoſe who make profeſſion of arms.

In a more reſtrained ſenſe, militia denotes the trained bands of a town or country, who arm themſelves, upon a ſhort warning, for their own defence. So that, in this ſenſe, militia is oppoſed to regular or ſtated troops.

For the direction and command of the militia, the king conſtitutes lords-lieutenants of each county.

MILIUM, in botany, a genus of the triandria digynia claſs. The corolla conſiſts of two valves including one flower. There are five ſpecies, only one of which, *viz.* the effuſum, or millet-graſs, is a native of Britain.

MILK, a well known animal fluid, which nature prepares in the breaſts of women, and the udders of other animals, for the nouriſhment of their young. Milk is a liquor prepared from the aliment chewed in the mouth, digeſted in the ſtomach, perfected by the force and juices of the inteſtines, and elaborated by means of the meſentery and its gland and juices, and the juices of the thoracic duct. It has undergone ſome actions of the veins, arteries, heart, lungs, and juices, and began to be aſſimilated; yet may ſtill be had ſeparate and diſcharged out of the body. And thus by their own milk, prepared from the proper matter of the chyle, all the known lactiferous animals are nouriſhed, both male and female. For milk is always prepared from chyle as well in men as in women, in virgins and barren women, in mothers and nurſes. Milk approaches nearer to an animal nature than chyle.

If milk be good, and ſuffered to reſt in a clean veſſel, it firſt appears uniformly white; then throws up a white, thick, unctuous cream to its ſurface, and remains ſomewhat bluiſh below. The milks of all the known animals have theſe properties alike. The human milk is very ſweet and thin, the next is that of aſſes, then that of mares, then of goats, and laſtly of cows: whence it is preſcribed in this order to conſumptive perſons of weak viſcera. The rennet prepared of the juices of ſuch creatures as chew the cud being mixed with milk, coagulates it into an uniform maſs, which may be cut with a knife, and it thus ſpontaneouſly ſeparates into whey and curds; if long boiled over the fire, it loſes its more fluid parts, and condenſes into a butyraceous and cheeſy maſs.

Milk is an efficacious remedy in diſorders of the breaſt. But it is to be obſerved, that all milks are not of the ſame kind, and of the ſame efficacy for all purpoſes; ſince, according to the diverſity of animals and their reſpective foods, they are poſſeſſed of different and peculiar qualities which are to be conſidered apart. Firſt, then, aſſes milk, contains a great deal of ſweet ſerum, but a very ſmall quantity of earthy, caſeous, and pinguious ſubſtance; for which reaſon it is not eaſily coagulated, and, conſequently, but very unfit for butter and cheeſe. Its whey is aſtringent, laxative, moiſtening, and proper for correcting the acrimony of the humours. Goats milk does not contain ſo large a quantity of whey as that of aſſes, nor is it of ſo laxative and aſtringent a nature, but of a thicker conſiſtence; and, as goats eat the leaves of trees which contain ſomething of a reſinous quality, their milk is very efficacious for the conſolidation of ſuppurated parts. Cows-milk is more pinguious, contains a large quantity of earth, but leſs whey, for which reaſon it generally yields a great deal of butter and cheeſe. This ſpecies of milk is of a temperating, nutritive and conſolidating virtue. Womens milk, for medicinal purpoſes, is preferable to all others; for it is the ſweeteſt of them all, and its nutritive quality is ſufficiently obſervable in infants. The virtues of milk are alſo different, according to the diverſity of herbs and paſturage which animals eat. Hence milk in the ſpring is highly ſalutary, becauſe at that time the vegetables abound with temperate juices; whereas milk in the winter is accounted leſs ſalutary, becauſe the animals feed on hay and ſtraw.

Dr. Cheyne recommends a milk and ſeed-diet, with water for drink, as the ſureſt preſervative againſt diſeaſes, and cure of them.

MILK FEVER. See MIDWIFERY, p. 244.

MILL, a machine or engine for grinding corn, *&c.* of which there are ſeveral kinds, according to the various methods of applying the moving power; as water-mills, wind-mills, mills worked by horſes, *&c.* See MECHANICS.

MILLENARIANS, or CHILIASTS, a name given to thoſe, who, in the primitive ages, believed that the ſaints will one day reign on earth with Jeſus Chriſt a thouſand years.

MILLEPES. See ONISCUS.

MILLERIA, a genus of the ſyngeneſia polygamia neceſſaria claſs. It has neither receptacle nor pappus; the calix conſiſts of three valves; and the radius of the corolla is dimidiated. There are two ſpecies, both natives of America.

MILLET, in botany. See MILIUM.

MILLING of cloth. See FULLING.

MILLION, in arithmetick, the number of ten hundred thouſand, or a thouſand times a thouſand. See ARITHMETICK.

MILLREE, a Portugueſe gold coin, value 5 *s* 7½ *d.*

MILO, or MELO, one of the iſlands of the Archipelago, ſixty miles north of Candia.

MILT, or MELT, is a denomination by which ſome call the rows of fiſhes.

MILTON,

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MILTON, the name of ſeveral market-towns, as one twelve miles north-eaſt of Dorcheſter, and another twelve miles north eaſt of Maidſtone.

MILVUS, in ornithology. See FALCO.

MIME, in the ancient comedy, a perſon who acted any character by mere geſtures, and hence denominated pantomime. See PANTOMIME.

MIMESIS, in rhetoric, the imitating the voice and geſtures of another perſon.

MIMOSA, the SENSITIVE PLANT, in botany, a genus of the polygamia monœcia claſs. The calix of the hermaphrodite conſiſts of five teeth, and the corolla of five ſegments; it has five or more ſtamina, one piſtillum, and the fruit is a pod; the calix, corolla, and ſtamina of the male are the ſame with thoſe of the female. There are 43 ſpecies, all natives of the Indies.—The mimoſa is called the ſenſitive plant from its remarkable property of ſhrinking its leaves and branches upon being touched by the hand or any thing elſe. This motion it performs by means of three diſtinct articulations, *viz.* of a ſingle leaf with its pedicle, of the pedicle to its branch, and of the branch to the trunk or main ſtem: the primary motion of all which is the cloſing of the two halves of the leaf on its rib; then the rib or pedicle itſelf cloſes; and if the motion wherewith the plant is moved be very ſtrong, the very branches have the ſenſation propagated to them, and apply themſelves to the main ſtem, as the ſimple leaves did before to their ribs, and theſe ribs to their branches; ſo that the whole plant, in this ſtate, forms itſelf, from a very complexly branched figure, into a ſort of ſtraight cylindrical one.

Many attempts have been made to account for the motion of this plant upon mechanical principles; but all theſe attempts have hitherto proved unſatisfactory.

MIMULUS, in botany, a genus of the didynamia angioſpermia claſs. The calix is priſmatical, and conſiſts of four teeth; the corolla is ringent, having the edges of the upper lip bent downwards; and the capſule has two cells, containing many ſeeds. There are two ſpecies, both natives of America.

MIMUSOPS, in botany, a genus of the octandria monogynia claſs. The calix conſiſts of eight leaves, and the corolla of eight petals; and the drupa is pointed. There are two ſpecies, both natives of India.

MINA, in Grecian antiquity, a money of account, equal to an hundred drachms.

MIND, a thinking intelligent being, otherwiſe called ſpirit, in oppoſition to matter or body.

The culture of the human mind is more immediately taught in the ſciences of logic and morals. See LOGIC and MORALS.

MINDANAO, the largeſt of the Philippine iſlands, except Luconia, is ſituated between 120° and 126° eaſt longitude, and between 5° and 10° N. lat.

MINDELHEIM, a city of Germany, thirty-three miles ſouth eaſt of Ulm. It is the capital of the principality of Mindelheim, conferred on the duke of Marlborough, by the emperor in 1704.

MINDEN, a city of Germany, the capital of a duchy of the ſame name, ſituated forty miles weſt of Hanover.

MINDORA, one of the Philippine iſlands, lies ſouth-weſt of Luconia, from which it is ſeparated by a narrow channel.

MINE, in natural hiſtory, a place under ground, where metals, minerals, or even precious ſtones are dug up.

As, therefore, the matter dug out of mines is various, the mines themſelves acquire various denominations, as gold mines, ſilver mines, copper mines, iron mines, diamond mines, ſalt mines, mines of antimony, of alum, *&c.*

Mines, then, in general, are veins or cavities within the earth, whoſe ſides receding from, or approaching nearer to each other, make them of unequal breadths in different places, ſometimes forming larger ſpaces which are called holes: they are filled with ſubſtances, which, whether metallic or of any other nature, are called the loads; when the ſubſtances forming theſe loads, are reducible to metal, the loads are by the miners ſaid to be alive, otherwiſe they are called dead loads. In Cornwal and Devon, the loads always hold their courſe from eaſtward to weſtward; though in other parts of England, they frequently run from north to ſouth. The miners report, that the ſides of the load never bear in a perpendicular, but conſtantly under-lay either to the north or to the ſouth. The load is frequently intercepted by the croſſing of a vein of earth, or ſtone, or ſome different metallic ſubſtance; in which caſe it generally happens that one part of the load is moved a conſiderable diſtance to the one ſide. This tranſient load is by the miners called flooking; and the part of the lead which is to be moved, is ſaid to be heaved.

According to Dr Nicols's obſervations upon mines, they ſeem to be, or to have been, the channels thro' which the waters paſs within the earth, and, like rivers, have their ſmall branches opening into them, in all directions. Moſt mines have ſtreams of water running through them; and when they are found dry, it ſeems to be owing to the waters having changed their courſe, as being obliged to it, either becauſe the load has ſtopped up the ancient paſſages, or that ſome new and more eaſy ones are made.

Mines, ſays Dr Shaw, are liable to many contingencies; being ſometimes poor, ſometimes ſoon exhauſtible, ſometimes ſubject to be drowned, eſpecially when deep, and ſometimes hard to trace; yet there are many inſtances of mines proving highly advantageous for hundreds of years: the mines of Potoſi are to this day worked with nearly the ſame ſucceſs as at firſt; the gold mines of Cremnitz have been worked almoſt theſe thouſand years; and our Corniſh tin mines are extremely ancient. The neat profit of the ſilver alone, dug in the Miſnian ſilver mines in Saxony, is ſtill, in the ſpace of eight years, computed at a thouſand ſix hundred and forty four millions, beſides ſeventy-three tons of gold. Many mines have been diſcovered by accident: a torrent firſt laid open a rich vein of the ſilver mine at Friburg in Germany; ſometimes a violent

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violent wind, by blowing up trees, or overturning the parts of rocks, has diſcovered a mine; the ſame has happened by violent ſhowers, earthquakes, thunder, the firing of woods, or even the ſtroke of a ploughſhare or horſe's hoof.

But the art of mining does not wait for theſe favourable accidents, but directly goes upon the ſearch and diſcovery of ſuch mineral veins, ores, or ſands, as may be worth the working for metal. The principal inveſtigation and diſcovery of mines depend upon a particular ſagacity, or acquired habit of judging from particular ſigns, that metallic matters are contained in certain parts of the earth, not far below its ſurface. The principal ſigns of a latent metallic vein, ſeem reducible to general heads; ſuch as, 1. The diſcovery of certain mineral waters. 2. The diſcolouration of the trees or graſs of a place. 3. The finding of pieces of ore on the ſurface of the ground. 4. The riſe of warm exhalations. 5. The finding of metallic ſands, and the like. All which are ſo many encouragements for making a ſtricter ſearch near the places where any thing of this kind appears; whence rules of practice might be formed for reducing this art to a greater certainty. But when no evident marks of a mine appears, the ſkilful mineraliſt uſually bores into the earth, in ſuch places as from ſome analogy of knowledge, gained by experience, or by obſerving the ſituation, courſe, or nature of other mines, he judges may contain metal.

After the mine is found, the next thing to be conſidered, is whether it may be dug to advantage. In order to determine this, we are duly to weigh the nature of the place, and its ſituation, as to wood, water, carriage, healthineſs, and the like; and compare the reſult with the richneſs of the ore, the charge of digging, ſtamping, waſhing, and ſmelting.

Particularly the form and ſituation of the ſpot ſhould be well conſidered. A mine muſt either happen, 1. In a mountain. 2. In a hill. 3. In a valley. Or, 4. In a flat. But mountains and hills are dug with much greater eaſe and convenience, chiefly becauſe the drains and burrows, that is, the adits or avenues, may be here readily cut, both to drain the water and to form gang-ways for bringing out the lead, *&c.* In all the four caſes we are to look out for the veins which the rains, or other accidental thing, may have laid bare; and if ſuch a vein be found, it may often be proper to open the mine at that place, eſpecially if the vein prove tolerably large and rich: otherwiſe the moſt commodious place for ſituation is to be choſe for the purpoſe, *viz.* neither on a flat, nor on the tops of mountains, but on the ſides. The beſt ſituation for a mine, is a mountainous, woody, wholeſome ſpot; of a ſafe eaſy aſcent, and bordering on a navigable river. The places abounding with mines are generally healthy, as ſtanding high, and every where expoſed to the air; yet ſome places, where mines are found, prove poiſonous, and can, upon no account, be dug, though ever ſo rich: the way of examining a ſuſpected place of this kind, is to make experiments upon brutes, by expoſing them to the effluvia or exhalations, to find the effects.

Devonſhire and Cornwal, where there are a great many mines of copper and tin, is a very mountainous country, which gives an opportunity in many places to make adits, or ſubterraneous drains, to ſome valley at a diſtance, by which to carry off the water from the mine, which otherwiſe would drown them out from getting the ore. Theſe adits are ſometimes carried a mile or two, and dug at a vaſt expence, as from 2000 l. to 4000 l. eſpecially where the ground is rocky; and yet they find this cheaper than to draw up the water out of the mine quite to the top, when the water runs in plenty, and the mine is deep. Sometimes, indeed, they cannot find a level near enough, to which an adit may be carried from the very bottom of the mine; yet they find it worth while to make an adit at half the height to which the water is to be raiſed, thereby ſaving half the expence.

The late Mr Coſtar, conſidering that ſometimes from ſmall ſtreams, and ſometimes from little ſprings, or collections of rain-water, one might have a pretty deal of water above ground, though not a ſufficient quantity to turn an overſhot-wheel, thought, that if a ſufficient fall might be had, this collection of water might be made uſeful in raiſing the water in a mine to the adit, where it may be carried off.

MINE, in the military art, denotes a ſubterraneous canal, or paſſage, dug under the wall or rampart of a fortification, intended to be blown up by gun-powder.

The alley or paſſage of a mine is commonly about four feet ſquare; at the end of this is the chamber of the mine, which is a cavity about five feet in width and in length, and about ſix feet in height; and here the gun powder is ſtowed. The fauciſſe of the mine, is the train, for which there is always a little aperture left. There are various kinds of mines, which acquire various names; as royal mines, ſerpentine mines, forked mines, according as their paſſages are ſtraight, oblique, winding, *&c.*

MINEHEAD, a borough and port town of Somerſetſhire, which ſends two members to parliament: W. long. 3° 20′, N. lat. 51° 18′.

MINERAL, in natural hiſtory, is uſed, in general, for all foſſil bodies, whether ſimple or compound, dug out of a ſubterraneous mine, from which it takes its denomination.

MINERAL *Waters*, in medicine, all thoſe wherein any medicinal virtues, beſides thoſe of common water, are found.

Theſe mineral waters are of various kinds, but they are conſidered under the general titles of chalybeate, purgative, and alterative. The more uſeful and commodious additions for examining theſe three kinds of mineral waters, are, according to Dr Shaw, galls, ſyrup of violets, and oil of tartar per deliquium. Galls diſcover in them any ſmall proportion of vitriol or diſſolved iron, as having the property of immediately ſtriking a purple or black colour in all waters where any ſuch ſubſtance is lodged. Spirit of violet, in the ſame

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ſame manner, diſcovers any ſmall predominancy of an acid or alkali therein, by changing the water red if acid, and green if alkali preſides. Oil of tartar diſcovers any ſmall proportion of earthy matter leſs capable of diſſolving in water than that ſalt, by precipitating ſuch earthy matter in form of a white cloud to the bottom of the containing glaſs, where it collects and appears like a ſubtile white powder.

Theſe particulars may be ſhewn, and proved ſatisfactorily, by adding to pure water a little of a known acid, alkali, diſſolved iron, and ſubtile earth, or fine light ſediment of an earthy water; applying the ſyrup of violets, galls, and oil of tartar reſpectively.

Mineral waters are imitable by art. The rule is, by a proper analyſis to find the contents of ſuch water (by evaporation, the addition of tinging ingredients, *&c.* as above mentioned) and their proportions; then, by means of ſynthetical chemiſtry, to compoſe a ſimilar mixture: thus, for example, we learn by a proper analyſis, that the ingredients, or different conſtituent parts of Pyrmont waters, are a ſubtile aqueous fluid, a volatile iron, and a predominating alkali, all joined together in one briſk pungent ſpirituous water. The imitation of this kind of chalybeate water, is by much the moſt difficult, and may perhaps be rendered moſt perfect, by boiling the pureſt common water in a cloſe veſſel, with a ſmall proportion of ochre, ſoft iron ore, or pyrites.

The imitation of the common purgative mineral waters is eaſy: thus Epſom water is imitated by barely diſſolving three or four drams of Epſom ſalt in a quart of pure water, made ſomewhat briſk or quick with a few drops of ſpirit of vitriol and oil of tartar per deliquium, ſo as to let the alkali prevail.

The imitation of the alterative waters, ſuch as thoſe of Bath, Buxton, *&c.* has hitherto ſcarce been attempted, nor can be rationally, for want of their reſpective juſt analyſis, upon which ſuch imitation ſhould always be grounded.

As to the uſe of mineral waters, the learned Heiſter obſerves, that in general they are found to agree much better with perſons in the middle ſtages of life, than with perſons very old or very young. If any general rule can be given in this caſe, it is, that people ſhould not take them when younger than eighteen, or older than ſixty.

MINERVALIA, in Roman antiquity, feſtivals celebrated in honour of Minerva, in the month of March; at which time the ſcholars had a vacation, and uſually made a preſent to their maſters, called, from this feſtival, *minerval*.

MINHO, a great river of Spain, which taking its riſe in Gallicia, divides that province from Portugal, and falls into the Atlantic at Caminha.

MINIATURE, a delicate kind of painting, diſtinguiſhed from all others by the ſmallneſs of the figures, its being performed with dots or points inſtead of lines; by the faintneſs of the colouring; its requiring to be viewed very near: and by its being uſually done on vellum.

This is the niceſt and moſt tedious of all kinds of painting, being performed wholly with the point of the pencil: for when the colours are laid on flat without dotting, though the figures be ſmall, and the ground either vellum or paper, it is not called painting in miniature, but waſhing. There are ſome painters who never uſe any white colour in painting in miniature, but make the ground of the vellum ſerve to raiſe their figures; in which caſe the lights appear bright in proportion to the depth and ſtrength of the colours of the figures. Others, before they go to work, give the vellum a light waſh with white lead well prepared and purified. Theſe colours that have the leaſt body, are the beſt and moſt commodious for painting in miniature; as carmine, ultramarine, fine lakes, and greens made of herbs and flowers: but beſides theſe, the following colours are alſo made uſe of, *viz.* vermilion, black lead, brown red, maſticote pale, yellow maſticote, indigo, ivory black, lamp black, Spaniſh brown, umber, gall ſtone, brown ochre, French pink, orpiment, gamboge, Naples yellow, bladder-green, verditer, ſea-green, German aſhes, flake white, and white lead. All terrene colours, and other groſs ſubſtances, are too coarſe for fine work, how well ſoever they may be ground: but the fineſt particles may be ſeparated by tempering the colour in a cup of fair water; and having ſtirred it well with your finger, and the whole being thoroughly mixed, let it ſubſide for a while, and then pour it by inclination into a ſhell that has been well ſcoured in hot water, and let it ſtand to dry. Yellow ochre, brown red, umber, and ultramarine, purify by fire; but if they are burnt in too fierce a fire, they change, and the brown red turns yellow, the yellow ochre and umber turn reddiſh, and ſo of the reſt: if the fire is not too fierce, it renders them ſofter and kinder than before, ſo that the fineſt and pureſt ultramarine, burnt in a red hot ſhovel, becomes much more brilliant than it was before it was burnt. Greens, blacks, greys, and yellows, on being mixed with a little of the gall of the ox, carp, or eel, eſpecially of the laſt, acquire a luſtre and vivacity not natural to them. You muſt take the galls of eels, and hang them on a nail to dry; and when you uſe any, ſteep it in brandy, and mingle ſome of it with the colour already tempered with gum-water wherein is a little ſugar-candy. When you begin to paint, the colours muſt be placed on a ſmall ivory pallet of the ſize of your hand, in the middle of which ſhould be placed the white, well ſpread out, and nearer it the lighter, and further off thoſe darker colours you are going to uſe.

Your vellum muſt be glued to a copper-plate, or a piece of thin board, exactly of the ſame ſize with the intended piece; in doing which, the fair ſide of the vellum ſhould be moiſtened with a fine wet linen; and a piece of white paper being put upon the back of it, it is to be applied to the plate or board, and ſtretching it upon it equally in all directions, the vellum, which ought to be every way a finger's-breadth larger than what you glue it to, in order to be doubled over and glued behind. When your piece is ſketched out upon the vellum with a pencil, you muſt, with a little thin carmine, run over all the ſtrokes that they may not be defaced in working; and this done, clean your vellum with crumb of bread. In laying on the colours, begin with ſketching or drawing with large, bold,

bold, but clear ſtrokes, like thoſe who paint in oil; your lights muſt at firſt be ſomething brighter, and your ſhades not quite ſo dark as is required in finiſhing; becauſe in ſtrippling upon them you ſtrengthen the colour, which, if too deep at firſt, would in finiſhing become too dark. Endeavour alſo to drown your colours into each other, that no line of ſeparation may be ſeen between them: to this purpoſe, ſoften your ſtrokes with the colours on each ſide of them, ſo that they may be blended and confounded with each other. There are ſeveral ways of ſtrippling, and every painter has his manner: ſome do it with round points, others make them longiſh; others again hath fine ſtrokes, croſſing each other in all directions, till the whole appears as if ſtrippled or wrought with points: this laſt method is the beſt, boldeſt, and ſooneſt perfected: the artiſt ſhould here accuſtom himſelf to be rich, mellow, and ſoft in his work; the points muſt ſeem in a manner loſt in the ground they are wrought upon, and appear but juſt enough to ſhew that the piece is ſtrippled. When the work ſeems finiſhed, heightening it a little has a fine effect; that is, ſtrengthening the lights with touches of a paler colour than at firſt, which muſt be ſoftened away into the reſt.

For laces, point, and the like, lay on firſt a mixture of blue, black, and white, as for linens; and then heighten the pattern, flowers or flouriſhes, with white only; then ſhade and finiſh with the firſt colour. When they are upon fleſh, or any thing elſe which you would have ſeen through them, finiſh what is under them, as if you intended to lay nothing upon it, and then lay on the lace or point with pure white, and finiſh with the other mixture. In painting a fur, lay on a ground as for drapery, according to the colours of it, and then ſhade by the ſame rule; and having done, inſtead of ſtrippling, draw fine ſtrokes this way and that, according as the down of the fur you imitate lies: heighten the lights of a brown fur with ochre and white, and thoſe of a light fur with white and a little blue.

There are ſeveral ſorts of grounds for pictures and portraits: ſome are quite brown, with Spaniſh brown, umber, *&c.* with a little black and white; others are more yellow, being mixed with a good deal of ochre; others are upon the grey, with indigo; and others are blue or crimſon.

To make a ground all of glory, firſt lay a bright mixture of a little ochre and white, adding more and more of the firſt, as you draw more and more towards the extremities of the intended picture; and when the ochre happens not to be dark enough (for you muſt go on darkening and darkening,) add gall-ſtone, then carmine, and at laſt Spaniſh brown. This ground you muſt lay in ſuch a manner, that the different degrees of darkneſs may, as much as poſſible, inſenſibly increaſe and ſtrengthen: the whole muſt then be ſtrippled with the ſame colours.

For a day-ſky, mingle ſome ultramarine with a good deal of white, and lay it on as ſmooth and uniform as poſſible with a large pencil and broad ſtrokes, laying it on paler and paler as you deſcend towards the horizon, which muſt be made of vermilion, mine-de-plumb and white, of the ſtrength that finiſhes the ſky, or rather a little weaker, artfully blending the blue and red, mingling at laſt gall-ſtone and a good deal of white; and all this muſt be ſo laid on that no ſeparation muſt be ſeen between the colours. When there are to be clouds in the ſky, you need lay on no blue where they are to be; but ſketch them out, if they are reddiſh, with vermilion, gall-ſtone, and white, together with a little indigo; and if they are to be darker, a great deal muſt be uſed of this laſt, making the lights of the one and the other with maſticot, vermilion, and white, according to the degree of ſtrength you would give them, ſwelling out the whole with ſtrippling; and if the ſky be not ſufficiently uniform, you muſt ſtripple that likewiſe.

MINIM, in muſic, a note equal to two crotchets, or half a ſemibreve. See MUSIC.

MINIMUM, in the higher geometry, the leaſt quantity attainable in a given caſe.

MINISTER, a perſon who preaches, performs religious worſhip in public, adminiſters the ſacraments, *&c.*

MINISTERS, in Scots law. See LAW, Tit. 5.

MINISTER *of ſtate*, a perſon to whom a ſovereign prince intruſts the adminiſtration of the government.

Foreign MINISTER, is a perſon ſent into a foreign country, to manage the affairs of his province, or of the ſtate to which he belongs. Of theſe there are two kinds; thoſe of the firſt rank are embaſſadors and envoys extraordinary, who repreſent the perſons of their ſovereigns. The miniſters of the ſecond rank are the ordinary reſidents. See EMBASSADOR.

MINIUM, or RED-LEAD. See CHEMISTRY, p. 84. and 136.

MINOR, in Scots law. See LAW, Tit. 7.

MINOR, in logic, the ſecond propoſition of a regular ſyllogiſm. See LOGIC.

MINORCA, an iſland in the Mediterranean, about twenty miles eaſt of Majorca, thirty miles long, and twelve broad. It is ſubject to Great Britain, and only valued for its capacious harbour of Port Mahon.

MINOTAUR, in antiquity, a fabulous monſter much talked of by the poets, feigned to be half man and half bull.

The minotaur was brought forth by Paſiphae, wife of Minos, king of Crete. It was ſhut up in the labyrinth of that iſland, and at laſt killed by Theſeus.

Servius gives the explanation of this fable: he ſays that a ſecretary of king Minos, named Taurus, *bull*, having an intrigue with the queen Paſiphae, in the chamber of Dædalus, ſhe was at length delivered of twins; one of whom reſembled Minos, and the other Taurus. This occaſioned the production to be reputed monſtrous.

MINSTREL, an ancient term for a fidler, or player on any other kind of muſical inſtrument.

MINT, the place in which the king's money is coined. See COINAGE.

There were anciently mints in almoſt every county in England; but the only mint at preſent in the Britiſh dominions, is that in the Tower of London. The officers of the mint are, 1. The warden of the mint, who is chief; he overſees the other officers, and receives the bullion. 2. The maſter worker; who receives the bullion

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bullion from the warden, cauſes it to be melted, delivers it to the moneyers, and when it is coined receives it again. 3. The comptroller, who is the overſeer of all the inferior officers, and ſees that all the money is made to the juſt aſſize. 4. The aſſay-maſter; who weighs the gold and ſilver, and ſees that it is according to the ſtandard. 5. The auditor; who takes the accounts. 6. The ſurveyor of the melting; who after the aſſay-maſter has made trial of the bullion, ſees that it is caſt out, and not altered after it is delivered to the melter. 7. The engraver; who engraves the ſtamps and dyes for the coinage of the money. 8. The clerk of the irons; who ſees that the irons are clean and fit to work with. 9. The melter; who melts the bullion before it is coined. 10. The provoſt of the mint; who provides for, and overſees all the moneyers, 11. The blanchers; who anneal and cleanſe the money. 12. The moneyers; ſome of whom forge the money, ſome ſhear it, ſame round and mill it, and ſome ſtamp or coin it. 13. The porters; who keep the gate of the mint.

MINT, in botany, See MENTHA.

MINUARTIA, in botany, a genus of the triandria trigynia claſs. The calix conſiſts of five leaves; it has no corolla; and the capſule has one cell and three valves. There are three ſpecies, all natives of Spain.

MINUET, in muſic, a very graceful kind of dance, which conſiſts of a coupee, a high ſtep, and a balance; it begins with a beat, and its motion is triple.

MINUTE, in geometry, the ſixtieth part of a degree of a circle. See ASTRONOMY, GEOGRAPHY, GEOMETRY.

MINUTE *of time*, the ſixtieth part of an hour.

MINUTE, in architecture, uſually denotes the ſixtieth, ſometimes the thirtieth part of a module. See ARCHITECTURE.

MINUTE is alſo uſed for a ſhort memoir, or ſketch of a thing, taken in writing.

MIRABILIS, MARVEL OF PERU, in botany, a genus of the pentandria monogynia claſs. The corolla is funnel ſhaped; the calix is below the fruit; and the nectarium is globular, including the germen. There are three ſpecies, all natives of America.

Tournefort and Linnæus will have the root of this plant to be the jalap of the ſhops; but Houſton declares, that jalap is the root of a ſpecies of convolvulus.

MIRACLE, is a work effected in a manner different from the common and regular method of providence, by the interpoſition either of God himſelf, or ſome intelligent agent ſuperior to man.

MIRALETUS, in ichthyology. See RAJA.

MISCHNAH, or MISNAH, the code or collection of the civil law of the Jews. The Jews pretend, that when God gave the written law to Moſes, he gave him alſo another not written, which was preſerved by tradition among the doctors of the ſynagogue, till rabbi Judah, ſurnamed the Holy, ſeeing the danger they were in, through their diſperſion, of departing from the traditions of their fathers, judged it proper to reduce them to writing.

The miſnah is divided in ſix parts: the firſt relates to the diſtinction of ſeeds in a field, to trees, fruits, tythes, *&c.* The ſecond regulates the manner of obſerving feſtivals: the third treats of women, and matrimonial caſes: the fourth of loſſes in trade, *&c.*: the fifth is on obligations, ſacrifices, *&c.*: and the ſixth treats of the ſeveral ſorts of purification.

MISDEMEANOUR, in law, ſignifies a heinous offence or fault, particularly in the execution of an office.

MISFEASANCE, in law-books, ſignifies a treſpaſs.

MISLETOE, in botany. See VISCUM.

MISNOMER, in law, a miſnaming, or miſtaking a perſon's name. The Chriſtian name of a perſon ſhould always be perfect, but the law is not ſo ſtrict and preciſe in regard to ſurnames, a ſmall miſtake in which will be diſpenſed with to make good a contract, and ſupport the act of the party.

MISPRISION ſignifies, in general, ſome neglect or overſight; as where a perſon is privy to a treaſon or felony committed by another, and neglects to reveal it to the king or his council, or to a magiſtrate; but entirely conceals it: this is called miſpriſion of thoſe crimes. In caſes of miſpriſion of treaſon, the offender is to be impriſoned for life, and to forfeit his goods and chattels, together with the profits of his lands, *&c.* but in miſpriſion of felony, the offender is only to be puniſhed with fine and impriſonment, and to remain in priſon till the fine is paid.

MISSAL, the Romiſh maſs-book, containing the ſeveral maſſes to be ſaid on particular days.

MISSEL BIRD See TURDUS.

MISSIONARIES, ſuch eccleſiaſtics as are ſent by any Chriſtian church, into pagan or infidel countries, to convert the natives, and eſtabliſh the Chriſtian religion among them.

MISUSER, in law, ſignifies ſome abuſe of any particular liberty or benefit.

MISY, in natural hiſtory, a ſpecies of the chalcantha, a foſſil very common in the Turkiſh dominions, and ſometimes found in the mines at Cremnitz in Hungary.

It is a conſiderably firm ſubſtance, of an irregular texture, not compact, much reſembling ſome of our more gaudy marchaſites, but wanting in their hardneſs and weight. It is of no determinate ſhape or ſize, but it is oftentimes found in ſmall detached maſſes, which are uſually broad, flat, and very rugged at the edges. As to its medical virtues, they are no other than thoſe of the green vitriol.

MITCHELLA, in botany, a genus of the tetrandria monogynia claſs. The corolla conſiſts of one petal; it has four ſtigmata; and the berry is bifid, containing four ſeeds. There is but one ſpecies, a native of Carolina.

MITE, a ſmall coin formerly current, equal to about one third part of a farthing.

MITE, in zoology. See ACARUS.

MITELLA, in botany, a genus of the decandria digynia claſs. The calix conſiſts of five ſegments, the corolla of five pinnatifid petals inſerted into the calix, and the capſule of two equal valves. There are two ſpecies, none of them natives of Britain.

MITRALES VALVULÆ. See ANATOMY, p. 279.

MITRE, a ſacerdotal ornament worn on the head by biſhops and certain abbots on ſolemn occaſions; being a

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ſort of cap, pointed, and cleft at top. The high prieſt among the Jews wore a mitre or bonnet on his head. The inferior prieſts among the Jews had likewiſe their mitres, but in what reſpect they differed from that of the high-prieſt is uncertain. Some contend that the ancient biſhops wore mitres, but this is by no means certain.

MITREOLA, in botany. See OPHIORRHIZA.

MITTAU, the capital of the duchy of Courland, in Poland: ſituated in E. long. 24°, N. lat. 56° 40′.

MITTIMUS, as generally uſed, hath two ſignifications. 1. It ſignifies a writ for removing and transferring of records from one court to another. 2. It ſignifies a precept, or command in writing under the hand and ſeal of a juſtice of the peace, directed to the gaoler or keeper of ſome priſon, for the receiving and ſafe keeping of an offender charged with any crime until he be delivered by due courſe of law.

MIXT, or MIXT BODY, in chemiſtry, that which is compounded of different elements or principles. See CHEMISTRY.

MIXTURE, a compound, or aſſemblage of ſeveral different bodies in the ſame maſs. See CHEMISTRY.

MIZEN, in the ſea-language, is a particular maſt or ſail. The mizen-maſt ſtands in the ſternmoſt part of the ſhip. In ſome great ſhips there are two of theſe; when that next the main-maſt is called the main-mizen, and that next the poop the bonaventure-mizen.

MNIUM, in botany, a genus of the cryptogamia muſci claſs. The anthera is operculated; and the capſulum of the female is naked, and duſty. There are 18 ſpecies, 7 of which are natives of Britain.

Perpetual MOBILE, or MOVEMENT. See MOVEMENT.

MOCO, or MOCHO, a great city and port-town of Arabia Felix, ſituated near the ſtraits of Babelmandel, at the entrance of the Red Sea: E. long 45°, N lat. 13°.

MODBURY, a market-town of Devonſhire, 32 miles ſouth-weſt of Exeter.

MODE, in metaphyſics, denotes the manner of a thing's exiſtence. See METAPHYSICS, p. 179.

MODE, in muſic, is defined to be a particular manner of conſtituting the octave; or, it is the melodious conſtitution of the octave, as it conſiſts of ſeven eſſential ſounds, beſides the key or fundamental.

A mode, then, is the particular order of the concinnous degrees of an octave; the fundamental note whereof may be called the key, as it ſignifies that principal note which regulates the reſt.

MODEL, in a general ſenſe, an original pattern, propoſed for any one to copy or imitate.

This word is particularly uſed, in building, for an artificial pattern made in wood, ſtone, plaſter, or other matter, with all its parts and proportions, in order for the better conducting and executing ſome great work, and to give an idea of the effect it will have in large. In all great buildings, it is much the ſureſt way to make a model in relievo, and not to truſt to a bare deſign or draught.

MODENA, a duchy of Italy, bounded by Mantua on the north, by Romania on the eaſt, by Tuſcany and Lucca on the ſouth, and by Parma and the territory of Genoa on the weſt.

MODENA, the capital of the duchy of that name, ſituated in 11° 20′ E. long. and 44° 45′ N. lat.

MODERATOR, in the ſchools, the perſon who preſides at a diſpute, or in a public aſſembly: thus the preſident of the annual aſſembly of the church of Scotland, is ſtyled moderator.

MODERN, in a general ſenſe, ſomething new, or of our time, in oppoſition to what is antique or ancient.

MODICA, a town of Sicily, in the province of Noto, twenty-five miles ſouth of Syracuſe.

MODIFICATION, in philoſophy, that which modifies a thing, or gives it this or that manner of being.

Quantity and quality are accidents which modify all bodies.

Decree of MODIFICATION, in Scots law, a decree aſcertaining the extent of a miniſter's ſtipend, without proportioning it among the perſons liable in payment. See LAW, Tit. v. 13.

MODILLIONS, in architecture, ornaments in the corniche of the Ionic, Corinthian, and Compoſite columns. See ARCHITECTURE.

MODIUS, in antiquity, a kind of dry meaſure, in uſe among the Romans, for ſeveral ſorts of grain.

MODULATION, in muſic, the art of keeping in, or changing the mode or key.

MODULE, in architecture, a certain meaſure or bigneſs, taken at pleaſure, for regulating the proportions of columns, and the ſymmetry or diſpoſition of the whole building. Architects generally chuſe the ſemidiameter of the bottom of the column for their module, and this they ſubdivide into parts or minutes. See ARCHITECTURE.

MOHERINGIA, in botany, a genus of the octandria digynia claſs. The calix has 4 leaves, and the corolla 4 petals, and the capſule conſiſts of one cell and 4 valves. There is but one ſpecies, a native of Switzerland.

MOFFAT, a village in the ſhire of Annandale, thirty-ſix miles ſouth weſt of Edinburgh; famous for its mineral wells, one of which is uſed for bathing, and the water of the other is taken inwardly. Theſe waters are of great ſervice in grippings of the guts, colics, and pains in the ſtomach. Thoſe who are troubled with obſtructions, rheumatic pains, and aches, find great relief both from bathing and drinking; nor is this water a leſs ſovereign remedy in ſcorbutic caſes, and the king's evil. Theſe wells, in the opinion of Dr Plummer, profeſſor of medicine in the univerſity of Edinburgh, owe their virtues to a ſulphureous principle.

MOGULS, or MONGULS, hoards or tribes of vagrant Tartars, on the north of India, from whom the moguls or ſovereigns of India, as well as of the Uſbec-Tartars, are deſcended.

MOHAIR, in commerce, the hair of a kind of goat, frequent about Angoura, in Turky; the inhabitants of which city are all employed in the manufacture of camblets, made of this hair.

MOHAWK-COUNTRY, a part of North America, inhabited by one of the five nations of the Iroquois, ſituated between the province of New York and the lake Ontario or Frontignac.

MOHILA,

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MOHILA, one of the Comora-iſlands in the Indian ocean, ſituated between Madagaſcar and the continent of Africa: E. long. 43° 30′, S. lat. 12°.

MOIDORE, a Portugueſe gold coin, value 1l. 7s. Serling.

MOIETY, the half of any thing.

MOLA, in geography, a town of Italy, ſeven miles eaſt of the city of Barri, in the kingdom of Naples.

Mola, in ichthyology. See Tetrodon.

MOLARES, or dentes molares, in anatomy, the large teeth called in Engliſh grinders. See Anatomy, p. 165.

MOLDAVIA, a province of European Turky, ſeparated from Poland by the river Neiſter.

MOLE, in zoology. See Talpa.

Mole Cricket. See Gryllus.

Mole, in midwifery, a maſs of fleſhy matter, of a ſpherical figure, generated in the uterus, or womb, and ſometimes miſtaken for a child. See Midwifery.

Mole, in geography, a river in Surry, ſo called from its running, for part of its courſe, under ground.

Mole, is alſo a maſſive work of large ſtones laid in the ſea by means of cofferdams; extending before a port, either to defend the harbour from the impetuoſity of the waves, or to prevent the paſſage of ſhips without leave.

Action of MOLESTATION, in Scots law. See Law, Tit. xxx. 19.

MOLLUGO, in botany, a genus of the triandria trigynia claſs. The calix conſiſts of five leaves; the corolla is wanting; and the capſule has three cells and three valves. There are five ſpecies, none of them natives of Britain.

MOLLOSSES, in commerce, the thick fluid matter remaining after the ſugar is made, reſembling ſyrup.

In Holland moloſſes are much uſed in the manufacture of tobacco, and by the poor people for ſugar. A brandy is alſo diſtilled from them, but it is ſaid to be unwholeſome.

MOLOSSUS, in Greek and Latin poetry, a foot compoſed of three long ſyllables, as *delectant*.

MOLUCCA-islands, five iſlands in the Indian ocean, the largeſt of which is ſcarce thirty miles round; they are called Bachian, Machian, Motyr, Ternate, and Tydor; they produce ſago, oranges, lemons, and ſome other fruits; but what is peculiar to theſe iſlands, is their producing cloves. They are ſubject to the Dutch, and are ſituated in 125° of eaſt longitude, and between 50′ ſouth, and 2° north latitude.

MOLUCCELLA, in botany, a genus of the didynamia gymnoſpermia claſs. The calix is bell-ſhaped, and larger than the corolla. There are three ſpecies, none of them natives of Britain.

MOLWITZ, a town of Sileſia, in the kingdom of Bohemia: E long. 16° 45′, N. lat. 50° 26′.

MOLYBDIA, in natural hiſtory, the name of a genus of cryſtals, of a cubic form, or compoſed of ſix ſides, at right angles, like a dye.

MOMBAZA, or Monbasa, an iſland and city on the eaſt coaſt of Africa, oppoſite to the country of Mombaza, in Zanguebar: E. long. 48°, N. lat. 4°.

MOMENT, in the doctrine of time, an inſtant, or the moſt minute and indiviſible part of duration.

MOMENTUM, in mechanics, ſignifies the ſame with impetus, or the quantity of motion in a moving body; which is always equal to the quantity of matter multiplied into the velocity; or, which is the ſame thing, it may be conſidered as a rectangle under the quantity of matter and velocity.

MOMORDICA, in botany, a genus of the monœcia ſyngeneſia claſs. The calix of the male and female conſiſts of five ſegments; the corolla of the male has ſix ſegments; and the filaments are three. The corolla of the female conſiſts of five ſegments; and it has three ſtyli. There are eight ſpecies, none of them natives of Britain.

MONA, an iſland in the Baltic, ſouth-weſt of the iſland of Zealand, ſubject to Denmark: E. long. 12° 30′, N. lat. 55° 20′.

MONADELPHIA, in botany. See Botany, p. 635.

MONAGHAN, a county of Ireland, in the province of Ulſter, bounded by Tyrone, on the north; by Armagh, on the eaſt; by Caven and Louth, on the ſouth; and by the county of Farmanagh, on the weſt.

MONANDRIA, in botany. See Botany, p. 635.

MONARCHY, a government in which the ſupreme power is veſted in a ſingle perſon. See Government.

MONARDA, in botany, a genus of the diandria monogynia claſs. The corolla is unequal, the ſuperior lip involving a linear filament. It has four ſeeds. There are five ſpecies, none of them natives of Britain.

MONASTERY, a convent, or houſe built for the reception and entertainment of monks, mendicant friars, or nuns, whether it be an abbey, priory, *&c.*

Monaſteries are governed by different rules, according to the different regulations preſcribed by their founders. The firſt regular and perfect monaſteries were founded by St. Pachomius, in Egypt: but St. Baſil is generally conſidered as the great father and patriarch of the Eaſtern monks; ſince in the fourth century he preſcribed rules for the government of the monaſteries, to which the Anachorets and Coenobites, and the other ancient fathers of the deſerts, ſubmitted. In like manner St. Benedict was ſtyled the patriarch of the Weſtern monks. He appeared in Italy towards the latter end of the fifth century, and publiſhed his rule, which was univerſally received throughout the weſt. St. Auguſtin being ſent into England by St. Gregory the pope, in the year 596, to convert the Engliſh, he at the ſame time introduced the monaſtic ſtate into this kingdom; which made ſuch progreſs here, that within the ſpace of two hundred years, there were thirty kings and queens who preferred the religious habit to their crowns, and founded ſtately monaſteries, where they ended their days in ſolitude and retirement.

MONASTIC, ſomething belonging to monks. See Monk.

MONCON, a two of Spain, in the province of Arragon, fifty miles north-eaſt of Saragoſſa.

MONDAY, the ſecond day of the week, ſo called as being anciently ſacred to the moon, *q d.* moon-day.

MONEMUGI, a country in the ſouth of Africa, ſituated between Angola and Zanguebar.

MONEY, a piece of matter, commonly metal, to which public authority has affixed a certain value and weight to ſerve as a medium in commerce.

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Of artificial or material money.

I. From the infancy of the world, at leaſt as far back as our accounts of the tranſactions of mankind reach, we find they had adopted the precious metals, that is, ſilver and gold, as the common meaſure of value, and as the adequate equivalent for every thing alienable.

The metals are admirably adapted for this purpoſe: They are perfectly homogeneous: When pure, their maſſes, or bulks, are exactly in proportion to their weights: No phyſical difference can be found between two pounds of gold, or ſilver, let them be the production of the mines of Europe, Aſia, Africa, or America: They are perfectly malleable, fuſible, and ſuffer the moſt exact diviſion which human art is capable to give them: They are capable of being mixed with one another, as well as with metals of a baſer, that is, of a leſs homogeneous nature, ſuch as copper: By this mixture they ſpread themſelves uniformly through the whole maſs of the compoſed lump, ſo that every atom of it becomes proportionally poſſeſſed of a ſhare of this noble mixture; by which means the ſubdiviſion of the precious metals is rendered very extenſive.

Their phyſical qualities are invariable; they loſe nothing by keeping; they are ſolid and durable; and though their parts are ſeparated by friction, like every other thing, yet ſtill they are of the number of thoſe which ſuffer leaſt by it.

If money, therefore, can be made of any thing, that is, if the proportional value of things vendible can be meaſured by any thing material, it may be meaſured by the metals.

II. The two metals being pitched upon as the moſt proper ſubſtances for realizing the ideal ſcale of money, thoſe who undertake the operation of adjuſting a ſtandard muſt conſtantly keep in their eye the nature and qualities of a ſcale, as well as the principles upon which it is formed.

The unit of the ſcale muſt conſtantly be the ſame, although realized in the metals, or the whole operation fails in the moſt eſſential part. This realizing the unit is like adjuſting a pair of compaſſes to a geometrical ſcale, where the ſmalleſt deviation from the exact opening once given muſt occaſion an incorrect meaſure. The metals, therefore, are to money what a pair of compaſſes is to a geometrical ſcale.

This operation of adjuſting the metals to the money of account implies an exact and determinate proportion of both metals to the money unit, realized in all the ſpecies and denominations of coin, adjuſted to that ſtandard.

The ſmalleſt particle of either metal added to, or taken away from any coin, which repreſent certain determinate parts of the ſcale, overturns the whole ſyſtem of material money. And if, notwithſtanding ſuch variation, theſe coins continue to bear the ſame denominations as before, this will as effectually deſtroy their uſefulneſs in meaſuring the value of things, as it would overturn the uſefulneſs of a pair of compaſſes, to ſuffer the opening to vary, after it is adjuſted to the ſcale repreſenting feet, toiſes, miles, or leagues, by which the diſtances up the plan are to be meaſured.

III. Debaſing the ſtandard is a good term; becauſe it conveys a clear and diſtinct idea. It is diminiſhing the weight of the pure metal contained in that denomination by which a nation reckons, and which we have called the money unit. Raiſing the ſtandard requires no farther definition, being the direct contrary.

IV. Altering the ſtandard (that is, raiſing or debaſing the value of the money unit) is like altering the national meaſures or weights. This is beſt diſcovered by comparing the thing altered with things of the ſame nature which have ſuffered no alteration. Thus if the foot of meaſure was altered at once over all England, by adding to it, or taking from it, any proportional part of its ſtandard length, the alteration would be beſt diſcovered, by comparing the new foot with that of Paris, or of any other country, which had ſuffered no alteration. Juſt ſo, if the pound ſterling, which is the Engliſh unit, ſhall be found any how changed, and if the variation it has met with be difficult to aſcertain, becauſe of a complication of circumſtances, the beſt way to diſcover it, will be to compare the former and the preſent value of it with the money of other nations which has ſuffered no variation. This the courſe of exchange will perform with the greateſt exactneſs.

V. Artiſts pretend, that the precious metals, when abſolutely pure from any mixture, are not of ſufficient hardneſe to conſtitute a ſolid and laſting coin. They are found alſo in the mines mixed with other metals of a baſer nature, and the bringing them to a ſtate of perfect purity occaſions an unneceſſary expence. To avoid, therefore, the inconvenience of employing them in all their purity, people have adopted the expedient of mixing them with a *determinate proportion* of other metals, which hurts neither their fuſibility, malleability, beauty, or luſtre. This metal is called *alloy;* and, being conſidered only as a ſupport to the principal metal, is accounted of no value in itſelf. So that eleven ounces of gold, when mixed with one ounce of ſilver, acquires, by that addition, no augmentation of value whatever.

This being the caſe, we ſhall, as much as poſſible, overlook the exiſtence of alloy, in ſpeaking of money, in order to render language leſs ſubject to ambiguity.

Incapacities of the metals to perform the office of an invariable meaſure of value.

I. Were there but one ſpecies of ſuch a ſubſtance as we have repreſented gold and ſilver to be; were there but one metal poſſeſſing the qualities of purity, diviſibility, and durability; the inconveniences in the uſe of it for money would be fewer by far than they are found to be as matters ſtand.

Such a metal might then, by an unlimited diviſion into parts exactly equal, be made to ſerve as a tolerably ſteady and univerſal meaſure. But the rivalſhip between the metals, and the perfect equality which is found between all their phyſical qualities, ſo far as regards purity and diviſibility, render them ſo equally well adapted to ſerve as the common meaſure of value, that they are univerſally admitted to paſs current as money.

What is the conſequence of this? That the one meaſures the value of the other, as well as that of every other thing. Now the moment any meaſure begins to be meaſured

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ſured by another, whoſe proportion to it is not phyſically, perpetually, and invariably the ſame, all the uſefulneſs of ſuch a meaſure is loſt. An example will make this plain.

A foot of meaſure is a determinate length. An Engliſh foot may be compared with the Paris foot, or with that of the Rhine; that is to ſay, it may be meaſured by them; and the proportion between their lengths may be expreſſed in numbers; which proportion will be the ſame perpetually. The meaſuring the one by the other will occaſion no uncertainty; and we may ſpeak of lengths by Paris feet, and be perfectly well underſtood by others who are uſed to meaſure by the Engliſh foot, or by the foot of the Rhine.

But ſuppoſe that a youth of twelve years old takes it into his head to meaſure from time to time, as he advances in age, by the length of his own foot, and that he divides this growing foot into inches and decimals: what can be learned from his account of meaſures! As he increaſes in years, his foot, inches, and ſubdiviſions, will be gradually lengthening; and were every man to follow his example, and meaſure by his own foot, then the foot of a meaſure now eſtabliſhed would totally ceaſe to be of any utility.

This is juſt the caſe with the two metals. There is no determinate invariable proportion between their value; and the conſequence of this is, that when they are both taken for meaſuring the value of other things, the things to be meaſured, like lengths to be meaſured by the young man's foot, without changing their relative proportion between themſelves, change however with reſpect to the denominations of both their meaſures. An example will make this plain.

Let us ſuppoſe an ox to be worth three thouſand pounds weight of wheat, and the one aud the other to be worth an ounce of gold, and an ounce of gold to be worth exactly fifteen ounces of ſilver: If the caſe ſhould happen, that the proportional value between gold and ſilver ſhould come to be as 14 is to 1, would not the ox, and conſequently the wheat, be eſtimated at leſs in ſilver, and more in gold, than formerly? Farther, would it be in the power of any ſtate to prevent this variation in the meaſure of the value of oxen and wheat, without putting into the unit of their money leſs ſilver and more gold than formerly.

If therefore any particular ſtate ſhould fix the ſtandard of the unit of their money to one ſpecies of the metals, while in fact both the one and the other are actually employed in meaſuring value; does not ſuch a ſtate reſemble the young man, who meaſures all by his growing foot? For if ſilver, for example, be retained as the ſtandard, while it is gaining upon gold one fifteenth additional value; and if gold continue all the while to determine the value of things as well as ſilver, it is plain, that, to all intents and purpoſes, this ſilver-meaſure is lengthening daily, like the young man's foot, ſince the ſame weight of it muſt become every day equivalent to more and more of the ſame commodity; notwithſtanding that we ſuppoſe the ſame proportion to ſubſiſt, without the leaſt variation, between that commodity and every other ſpecies of things alienable.

Buying and ſelling are purely conventional, and no man is obliged to give his merchandize at what may be ſuppoſed to be the proportion of its worth. The uſe, therefore of an univerſal meaſure, is, to mark, not only the relative value of the things to which it is applied as a meaſure. but to diſcover in an inſtant the proportion between the value of thoſe, and of every other commodity valued by a determinate meaſure in all the countries of the world.

Were pounds ſterling, livres, florins, piaſtres, *&c.* which are all money of account, invariable in their values, what a facility would it produce in all converſions, what an aſſiſtance to trade! But as they are all limited or fixed to coins, and conſequently vary from time to time, this example ſhews the utility of the invariable meaſure which we have deſcribed.

There is another circumſtance which incapacitates the metals from performing the office of money; the ſubſtance of which the coin is made, is a commodity, which riſes and ſinks in its value with reſpect to other commodities, according to the wants, competition, and caprices of mankind. The advantage, therefore, found in putting an intrinſic value into that ſubſtance which performs the function of money of account, is compenſated by the inſtability of that intrinſic value; and the advantage obtained by the ſtability of paper, or ſymbolical money, is compenſated by the defect it commonly has of not being at all times ſuſceptible of realization into ſolid property or intrinſic value.

In order, therefore, to render material money more perfect, this quality of metal, that is, of a commodity, ſhould be taken from it; and in order to render paper-money more perfect, it ought to be made to circulate upon metallic or land ſecurity.

II. There are ſeveral ſmaller inconveniences accompanying the uſe of the metals, which we ſhall here ſhortly enumerate.

1*mo.* No money made of gold or ſilver can circulate long. without loſing of its weight, although it all along preſerves the ſame denomination. This repreſents the contracting a pair of compaſſes which had been rightly adjuſted to the ſcale.

2*do* Another inconvenience proceeds from the fabrication of money. Suppoſing the faith of Princes who coin money to be inviolable, and the probity as well as capacity of thoſe to whom they commit the inſpection of the fineneſs of the metals to be ſufficient, it is hardly poſſible for workmen to render every piece exactly of a proper weight, or to preſerve the due proportion between pieces of different denominations; that is to ſay, to make every ten ſixpences exactly of the ſame weight with every crown-piece and every five ſhillings ſtruck in a coinage. In proportion to ſuch inaccuracies, the parts of the ſcale become unequal.

3*tio.* Another inconvenience, and far from being inconſiderable, flows from the expence requiſite for the coining of money. This expence adds to its value as a manufacture, without adding any thing to its weight.

4*to.* The laſt inconvenience is, that by fixing the money of account entirely to the coin, without having any independent common meaſure (to mark and control theſe deviations from mathematical exactneſs, which are either inſeparable

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inſeparable from the metals themſelves, or from the fabrication of them) the whole meaſure of value, and all the relative intereſts of debtors and creditors, become at the diſpoſal not only of workmen in the mint, of Jews who deal in money, of clippers and waſhers of coin, but they are alſo entirely at the mercy of princes, who have the right of coinage, and who have frequently alſo the right of raiſing or debaſing the ſtandard of the coin, according as they find it moſt for their preſent and temporary intereſt.

Methods which may be propoſed for leſſening the ſeveral inconveniences to which material money is liable.

The inconveniences from the variation in the relative value of the metals to one another, may in ſome meaſure be obviated by the following expedients.

1*mo*. By conſidering one only as the ſtandard, and leaving the other to ſeek its own value, like any other commodity.

2*do*. By conſidering one only as the ſtandard, and fixing the value of the other from time to time by authority, according as the market-price of the metals ſhall vary.

3*tio*. By fixing the ſtandard of the unit according to the mean proportion of the metals, attaching it to neither; regulating the coin accordingly; and upon every conſiderable variation in the proportion between them, either to make a new coinage, or to raiſe the denomination of one of the ſpecies, and lower it in the other, in order to preſerve the unit exactly in the mean proportion between the gold and ſilver.

4*to*. To have two units, and two ſtandards, one of gold, and one of ſilver, and to allow every body to ſtipulate in either.

5*to*. Or laſt of all, to oblige all debtors to pay one half in gold, and one half in the ſilver ſtandard.

Variations to which the value of the money-unit is expoſed from every diſorder in the coin.

Let us ſuppoſe, at preſent, the only diſorder to conſiſt in a want of the due proportion between the gold and ſilver in the coin.

This proportion can only be eſtabliſhed by the market-price of the metals; becauſe an augmentation and riſe in the demand for gold or ſilver has the effect of augmenting the value of the metal demanded. Let us ſuppoſe, that to day one pound of gold may buy fifteen pounds of ſilver; if to-morrow there be a high demand for ſilver, a competition among merchants to have ſilver for gold will enſue; they will contend who ſhall get the ſilver at the rate of fifteen pounds for one of gold: this will raiſe the price of it; and in proportion to their views of profit, ſome will accept of leſs than the fifteen pounds. This is plainly a raiſe in the ſilver, more properly than a fall in the gold; becauſe it is the competition for the ſilver which has occaſioned the variation in the former proportion between the metals.

Let us now ſuppoſe, that a ſtate, having with great exactneſs examined the proportion of the metals in the market, and having determined the preciſe quantity of each for realizing or repreſenting the money-unit, ſhall execute a moſt exact coinage of gold and ſilver coin. As long as that proportion continues unvaried in the market, no inconvenience can reſult from that quarter, in making uſe of metals for money of account.

But let us ſuppoſe the proportion to change; that the ſilver, for example, ſhall riſe in its value with regard to gold; will it not follow, from that moment, that the unit realized in the ſilver, will become of more value than the unit realized in the gold coin?

But as the law has ordered them to paſs as equivalents for one another, and as debtors have always the option of paying in what legal coin they think fit, will they not all chuſe to pay in gold, and will not then the ſilver coin be melted down or exported, in order to be ſold as bullion, above the value it bears when it circulates in coin? Will not this paying in gold alſo really diminiſh the value of the money unit, ſince upon this variation every thing muſt ſell for more gold than before, as we have already obſerved?

Conſequently, merchandize which have not varied in their relative value to any other thing but to gold and ſilver, muſt be meaſured by the mean proportion of the metals; and the application of any other meaſure to them is altering the ſtandard. If they are meaſured by the gold, the ſtandard is debaſed; if by ſilver, it is raiſed.

If, to prevent the inconvenience of melting down the ſilver, the ſtate ſhall give up affixing the value of their unit to both ſpecies at once, and ſhall fix it to one, leaving the other to ſeek its price as any other commodity; in that caſe, no doubt, the melting down of the coin will be prevented; but will ever this reſtore the value of the money unit to its former ſtandard? Would it, for example, in the foregoing ſuppoſition, raiſe the debaſed value of the money-unit in the gold coin, if that ſpecies were declared to be the ſtandard? It would indeed render ſilver coin purely a merchandize, and, by allowing it to ſeek its value, would certainly prevent it from being melted down as before; becauſe the pieces would riſe conventionally in their denomination; or an agio, as it is called, would be taken in payments made in ſilver; but the gold would not, on that account, riſe in its value, or begin to purchaſe any more merchandize than before. Were therefore the ſtandard fixed to the gold, would not this be an arbitrary and a violent revolution in the value of the money-unit, and a debaſement of the ſtandard?

If, on the other hand, the ſtate ſhould fix the ſtandard to the ſilver, which we ſuppoſe to have riſen in its value, would that ever ſink the advanced value which the ſilver coin had gained above the worth of the former ſtandard unit? and would not this be a violent and an arbitrary revolution in the value of the money unit, and a raiſing of the ſtandard?

The only expedient, therefore, is, in ſuch a caſe, to fix the numerary unit to neither of the metals, but to contrive a way to make it fluctuate in a mean proportion between them; which is in effect the introduction of a pure ideal money of account.

The regulation of fixing the unit by the mean proportion, ought to take place at the inſtant the ſtandard unit is affixed with exactneſs both to the gold and ſilver. If it

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it be introduced long after the market proportion between the metals has deviated from the proportion eſtabliſhed in the coin; and if the new regulation is made to have a retroſpect, with regard to the acquitting of permanent contracts entered into, while the value of the money-unit had attached itſelf to the loweſt currency, in conſequence of the principle above laid down; then the reſtoring the money-unit to that ſtandard where it ought to have remained (to wit, to the mean proportion) is an injury to all debtors who have contracted ſince the time that the proportion of the metals began to vary.

This is clear from the former reaſoning. The moment the market-price of the metals differs from that in the coin, every one who has payments to make, pays in that ſpecies which is the higheſt rated in the coin; conſequently, he who lends, lends in that ſpecies. If after the contract, therefore, the unit is carried up to the mean proportion, this muſt be a loſs to him who had borrowed.

From this we may perceive, why there is leſs inconvenience from the varying of the proportion of the metals, where the ſtandard is fixed to one of them, than when it is fixed to both. In the firſt caſe, it is at leaſt uncertain whether the *ſtandard* or the *merchandize-ſpecies* is to riſe; conſequently it is uncertain whether the debtors or the creditors are to gain by a variation. If the *ſtandard* ſpecies ſhould riſe, the creditors will gain; if the *merchandize-ſpecies* riſes, the debtors will gain; but when the unit is attached to both ſpecies, then the creditors never can gain, let the metals vary as they will: if ſilver riſes, then debtors will pay in gold; if gold riſes, debtors will pay in ſilver. But whether the unit be attached to one or to both ſpecies, the infallible conſequence of a variation is, that one half of the difference is either gained or loſt by debtors and creditors. The invariable unit is conſtantly the mean proportional between the two meaſures.

How the variations in the intrinſic value of the unit of money muſt affect all the domeſtic intereſt of a Nation.

If the changing the content of the buſhel by which grain is meaſured, would affect the intereſt of thoſe who are obliged to pay, or who are intitled to receive, a certain number of buſhels of grain for the rent of lands; in the ſame manner muſt every variation in the value of the unit of accompt affect all perſons who, in permanent contracts, are obliged to make payments, or who are intitled to receive ſums of money ſtipulated in multiples or in fractions of that money unit.

Every variation, therefore, upon the intrinſic value of the money unit, has the effect of benefiting the claſs of creditors, at the expence of debtors, or *vice verſa*.

This conſequence is deduced from an obvious principle. Money is more or leſs valuable in proportion as it can purchaſe more or leſs of every kind of merchandize. Now without entering anew into the cauſes of the riſe and fall of prices, it is agreed upon all hands, that whether an augmentation of the general maſs of money in circulation has the effect of raiſing prices in general, or not, any augmentation of the quantity of the metals appointed to be put into the money-unit, muſt at leaſt affect the value of that money-unit, and make it purchaſe more of any commodity than before; that is to ſay, if 113 grains of fine gold, the preſent weight of a pound ſterling in gold, can buy 113 pounds of flour; were the pound ſterling raiſed to 114 grains of the ſame metal, it would buy 114 pounds of flour; conſequently, were the pound ſterling augmented by one grain of gold, every miller who paid a rent of ten pounds a year, would be obliged to ſell 1140 pounds of his flour, in order to procure 10 pounds to pay his rent, in place of 1130 pounds of flour which he ſold formerly to procure the ſame ſum; conſequently, by this innovation, the miller muſt loſe yearly ten pounds of flour, which his maſter conſequently muſt gain. From this example, it is plain, that every augmentation of metals put into the pound ſterling, either of ſilver or gold, muſt imply an advantage to the whole claſs of creditors who are paid in pounds ſterling, and conſequently muſt be a proportional loſs to all debtors who muſt pay by the ſame denomination.

Of the diſorder in the Britiſh coin, for ſo far as it occaſions the melting down or the exporting of the ſpecie.

THE defects in the Britiſh coin are three.

1*mo*. The proportion between the gold and ſilver in it is found to be as 1 to $15\frac{5}{11}$, whereas the market price may be ſuppoſed to be nearly as 1 to $14\frac{1}{2}$.

2*do*. Great part of the current money is worn and light.

3*tio*. From the ſecond defect proceeds the third, to wit, that there are ſeveral currencies in circulation which paſs for the ſame value, without being of the ſame weight.

4*to*. From all theſe defects reſults the laſt and greateſt inconvenience, to wit, that ſome innovation muſt be made, in order to ſet matters on a right footing.

The Engliſh, beſides the unit of their money which they call the pound ſterling, have alſo the unit of their weight for weighing the precious metals.

This is called the pound troy, and conſiſts of 12 ounces, every ounce of 20 penny weight, and every penny-weight of 24 grains. The pound troy, therefore, conſiſts of 240 penny-weight, and 5760 grains.

The fineneſs of the ſilver is reckoned by the number of ounces and penny-weights of the pure metals in the pound troy of the compoſed maſs; or in other words, the pound troy, which contains 5760 grains of ſtandard ſilver, contains 5328 grains of fine ſilver, and 432 grains of copper, called alloy.

Thus ſtandard ſilver is 11 ounces 2 penny-weights of fine ſilver in the pound troy to 18 penny-weights copper, or 111 parts fine ſilver to 9 parts alloy.

Standard gold is 11 ounces fine to one ounce ſilver or copper employed for alloy, which together make the pound troy; conſequently, the pound troy of ſtandard gold, contains 5280 grains fine, and 480 grains alloy, which alloy is reckoned of no value.

This pound of ſtandard ſilver is ordered, by ſtatute of the 43d of Elizabeth, to be coined into 62 ſhillings, 20 of which make the pound ſterling; conſequently the 20 ſhillings contain 1718.7 grains of fine ſilver, and 1858.06 ſtandard ſilver.

The pound troy of ſtandard gold, $\frac{11}{12}$ fine, is ordered

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by an act of King Charles II. to be cut into 44 ½ guineas; that is to say, every guinea contains 129.43 grains of ſtandard gold, and 118.644 of fine gold; and the pound ſterling, which is $\frac{20}{21}$ of the guinea, contains 112.994, which we may ſtate at 113 grains of fine gold.

The coinage in England is entirely defrayed at the expence of the ſtate. The mint price for the metals is the very ſame with the price of the coin. Whoever carries to the mint an ounce of ſtandard ſilver, receives for it in ſilver coin *5 s. 2 d.* or *62 d:* whoever carries an ounce of ſtandard gold receives in gold coin *3 l. 17 s. 10 d* ½. the one and the other making exactly an ounce of the ſame fineneſs with the bullion. Coin, therefore, can have no value in the market above bullion; conſequently, no loſs can be incurred by thoſe who melt it down.

When the guinea was firſt ſtruck, the government (not inclining to fix the pound ſterling to the gold coin of the nation) fixed the guinea at 20 ſhillings, (which was then below its proportion to the ſilver) leaving it to ſeek its own price above that value, according to the courſe of the market.

By this regulation no harm was done to the Engliſh ſilver ſtandard; becauſe the guinea, or 118.644 grains fine gold being worth more, at that time, than 20 ſhillings, or 1718.7 grains fine ſilver, no debtor would pay with gold at its ſtandard value, and whatever it was received for above that price was purely conventional.

Accordingly guineas fought their own price until the year 1728, that they were fixed a-new, not below their value as at firſt, but at what was then reckoned their exact value, according to the proportion of the metals, to wit, at 21 ſhillings, and at this they were ordered to paſs current in all payments.

This operation had the effect of making the gold a ſtandard as well as the ſilver. Debtors then paid indifferently in gold as well as in ſilver, becauſe both were ſuppoſed to be of the ſame intrinſic as well as current value; in which caſe no inconvenience could follow upon this regulation. But, in time, ſilver came to be more demanded; the making of plate began to prevail more than formerly, and the exportation of ſilver to the Eaſt Indies increaſing yearly, made the demand for it greater, or perhaps brought its quantity to be proportionally leſs than before. This changed the proportion of the metals; and by ſlow degrees they have come from that of 1 to 15.2 (the proportion they were ſuppoſed to have when the guineas were fixed and made a lawful money at 21 ſhillings) to that of 14.5 the preſent *ſuppoſed* proportion.

The conſequence of this has been, that the ſame guinea which was worth 1804.6 grains fine ſilver, at the time it was fixed at 21 ſhillings, is now worth no more than 1719.9 grains of fine ſilver according to the proportion of 14½ to 1.

Conſequently, debtors, who have always the option of the legal ſpecies in paying their debts, will pay pounds ſterling no more in ſilver but in gold; and as the gold pounds they pay in, are not intrinſically worth the ſilver pounds they paid in formerly, according to the ſtatute of Elizabeth, it follows that the pound ſterling in ſilver is really no more the ſtandard, ſince no body will pay at that rate, and ſince no body can be compelled to do it.

Beſides this want of proportion between the metals, the ſilver coined before the reign of George I. is now become light by circulation; and the guineas coined by all the Princes ſince Charles II. paſs by tale, though many of them are conſiderably diminiſhed in their weight.

Let us now examine what profit the want of proportion and the want of weight in the coin can afford to the money-jobbers, in melting it down or exporting it.

Did every body conſider coin only as the meaſure for reckoning value, without attending to its value as a metal, the deviations of gold and ſilver coin from perfect exactneſs either as to proportion or weight would occaſion little inconvenience.

Great numbers indeed, in every modern ſociety, conſider coin in no other light, than that of money of accompt; and have great difficulty to comprehend what difference any one can find between a light ſhilling and a heavy one; or what inconvenience there can poſſibly reſult from a guinea's being ſome grains of fine gold too light to be worth 21 ſhillings ſtandard weight. And did every one think in the ſame way, there would be no occaſion for coin of the precious metals at all; leather, copper, iron, or paper, would keep the reckoning as well as gold and ſilver.

But although there be many who look no farther than at the ſtamp on the coin, there are others whoſe ſole buſineſs it is to examine its intrinſic worth as a commodity, and to profit of every irregularity in the weight and proportion of metals.

By the very inſtitution of coinage, it is implied, that every piece of the ſame metal, and ſame denomination with regard to the money-unit, ſhall paſs current for the ſame value.

It is, therefore, the employment of money-jobbers, to examine, with a ſcrupulous exactneſs, the preciſe weight of every piece of coin which comes into their hands.

The firſt object of their attention, is, the price of the metals in the market: a jobber finds, at preſent, that with 14.5 pounds of fine ſilver bullion, he can buy one pound of fine gold bullion.

He therefore buys up with gold coin, all the new ſilver as faſt as it is coined, of which he can get at the rate of 15.2 pounds for one in gold; theſe 15.2 pounds ſilver coin he melts down into bullion, and converts that back into gold bullion, giving at the rate of only 14.5 pounds for one.

By this operation he remains with the value of $\frac{7}{10}$ of one pound weight of ſilver bullion clear profit upon the 15½ pounds he bought; which $\frac{7}{10}$ is really loſt by the man who inadvertently coined ſilver at the mint, and gave it to the money-jobber for his gold. Thus the ſtate loſes the expence of the coinage, and the public the convenience of change for their guineas.

But here it may be aſked, Why ſhould the money-jobber melt down the ſilver coin? can he not buy gold with it as well without melting it down? He cannot; becauſe when it is in coin, he cannot avail himſelf of its being new and weighty. Coin goes by tale, not by weight; therefore, were he to come to market with his new ſilver coin, gold bullion being ſold at the mint price, we ſhall ſuppoſe, viz. at *3 l. 17 s. 10½ d.* ſterling money

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per ounce, he would be obliged to pay the price of what he bought with heavy money, which he can equally do with light.

He therefore melts down the new ſilver coin, and ſells it for bullion, at ſo many pence an ounce, the price of which bullion is, in the Engliſh market, always above the price of ſilver at the mint, for the reaſons now to be given.

When you ſell ſtandard ſilver bullion at the mint, you are paid in weighty money; that is, you receive for your bullion the very ſame weight in ſtandard coin; the coinage coſts nothing: but when you ſell bullion in the market, you are paid in worn out ſilver, in gold, in bank notes, in ſhort, in every ſpecies of lawful current money. Now all theſe payments have ſome defect: the ſilver you are paid with is worn and light; the gold you are paid with is over rated, and perhaps alſo light; and the bank notes muſt have the ſame value with the ſpecie with which the bank pays them; that is, with light ſilver or over-rated gold.

It is for theſe reaſons, that ſilver bullion, which is bought by the mint at 5 *s.* 2 *d. per* ounce of heavy ſilver money, may be bought at market at 65 pence the ounce in light ſilver, over-rated gold, or bank notes, which is the ſame thing.

Farther, we have ſeen how the impoſition of coinage has the effect of raiſing coin above the value of bullion, by adding a value to it which it had not as a metal.

Juſt ſo, when the unit is once affixed to certain determined quantities of both metals, if one of the metals ſhould afterwards riſe in value in the market, the coin made of that metal muſt loſe a part of its value as coin, although it retains it as a metal. Conſequently, as in the firſt caſe, it acquired an additional value by being coined, it muſt now acquire an additional value by being melted down. From this we may conclude, that when the ſtandard is affixed to both the metals in the coin, and when the proportion of that value is not made to follow the price of the market, that ſpecies which riſes in the market is melted down, and the bullion is ſold for a price as much exceeding the mint price as the metal has riſen in its value.

If, therefore, in England, the price of ſilver bullion is found to be at 65 pence the ounce, while at the mint it is rated at 62; this proves that ſilver has riſen $\frac{3}{62}$ above the proportion obſerved in the coin, and that all coin of ſtandard weight may conſequently be melted down with a profit of $\frac{3}{62}$. But as there are ſeveral other circumſtances to be attended to, which regulate and influence the price of bullion, we ſhall here paſs them in review, the better to diſcover the nature of this diſorder in the Engliſh coin, and the advantages which money-jobbers may draw from it.

The price of bullion, like that of every other merchandize, is regulated by the value of the money it is paid with.

If bullion, therefore, ſells in England for 65 pence an ounce, paid in ſilver coin, it muſt ſell for 65 ſhillings the pound troy; that is to ſay, the ſhillings it is commonly paid with do not exceed the weight of $\frac{1}{62}$ of a pound troy: for if the 65 ſhillings with which the pound of bullion is paid weighed more than a pound troy, it would be a ſhorter and better way for him who wants bullion to melt down the ſhillings and make uſe of the metal, than to go to market with them in order to get leſs.

We may, therefore, be very certain, that no man will buy ſilver bullion at 65 pence an ounce, with any ſhilling which weighs above $\frac{1}{62}$ of a pound troy.

We have gone upon the ſuppoſition that the ordinary price of bullion in the Engliſh market is 65 pence *per* ounce. This has been done upon the authority of ſome late writers on this ſubject: it is now proper to point out the cauſes which may make it deviate from that value.

I. It may vary, and certainly will vary, in the price, according as the currency is better or worſe. When the expences of a war, or a wrong balance of trade, have carried off a great many heavy guineas, it is natural that bullion ſhould riſe; becauſe then it will be paid for more commonly in light gold and ſilver; that is to ſay, with pounds ſterling, below the value of 113 grains fine gold, the worth of the pound ſterling in new guineas.

II. This wrong balance of trade, or a demand for bullion abroad, becoming very great, may occaſion a ſcarcity of the metals in the market, as well as a ſcarcity of the coin; conſequently, an advanced price muſt be given for it in proportion to the greatneſs and height of the demand. In this caſe, both the ſpecie and the bullion muſt be bought with paper. But the riſe in the price of bullion proceeds from the demand for the metals, and the competition between merchants to procure them, and not becauſe the paper given as the price is at all of inferior value to the ſpecie. The leaſt diſcredit of this kind would not tend to diminiſh the value of the paper; it would annihilate it at once. Therefore, ſince the metals muſt be had, and that the paper cannot ſupply the want of them when they are to be exported, the price riſes in proportion to the difficulties in finding metals elſewhere than in the Engliſh market.

III. A ſudden call for bullion, for the making of plate. A goldſmith can well afford to give 67 pence for an ounce of ſilver, that is to ſay, he can afford to give one pound of gold for 14 pounds of ſilver, and perhaps for leſs, notwithſtanding that what he gives be more than the ordinary proportion between the metals, becauſe he indemniſies himſelf amply by the price of his workmanſhip: juſt as a tavern keeper will pay any price for a fine fiſh, becauſe, like the goldſmith, he buys for other people.

IV. The mint price has as great an effect in bringing down the price of bullion, as exchange has in raiſing it. In countries where the metals in the coin are juſtly proportioned, where all the currencies are of legal weight, and where coinage is impoſed, the operations of trade make the price of bullion conſtantly to fluctuate between the value of the coin and the mint price of the metals.

Now let us ſuppoſe that the current price of ſilver bullion in the market is 65 pence the ounce, paid in lawful money, no matter of what weight, or of what metal. Upon this the money jobber falls to work. All ſhillings which are above $\frac{1}{62}$ of a pound troy, he throws into his melting

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melting pot, and ſells them as bullion, for 65*d. per* ounce; all thoſe which are below that weight he carries to market, and buys bullion with them, at 65 pence *per* ounce.

What is the conſequence of this?

That thoſe who ſell the bullion, finding the ſhillings which the money-jobber pays with perhaps not above $\frac{1}{66}$ of a pound troy, they on their ſide raiſe the price of their bullion to 66 pence the ounce.

This makes new work for the money-jobber; for he muſt always gain. He now weighs all ſhillings as they come to hand; and as formerly he threw into his melting-pot thoſe only which were worth more than $\frac{1}{61}$ of a pound troy, he now throws in all that are in value above $\frac{1}{66}$. He then ſells the melted ſhillings at 66 pence the ounce, and buys bullion with the light ones at the ſame price.

This is the conſequence of ever permitting any ſpecies of coin to paſs by the authority of the ſtamp, without controlling it at the ſame time by the weight: and this is the manner in which money-jobbers gain by the currency of light money.

It is no argument againſt this expoſition of the matter to ſay, that ſilver bullion is ſeldom bought with ſilver coin; becauſe the pence in new guineas are worth no more than the pence of ſhillings of 65 in the pound troy: that is to ſay, that 240 pence contained in $\frac{20}{21}$ of a new guinea, and 240 pence contained in 28 ſhillings of 65 to the pound troy differ no more in the intrinſic value than 0.88 of a grain of fine ſilver upon the whole, which is a mere trifle.

Whenever, therefore, ſhillings come below the weight of $\frac{1}{61}$ of a pound troy, then there is an advantage in changing them for new guineas: and when that is the caſe, the new guineas will be melted down, and profit will be found in ſelling them for bullion, upon the principles we have juſt been explaining.

We have already given a ſpecimen of the domeſtic operations of the money-jobbers; but theſe are not the moſt prejudicial to national concerns. The jobbers may be ſuppoſed to be Engliſhmen; and in that caſe the profit they make remains at home: but whenever there is a call for bullion to pay the balance of trade, it is evident that this will be paid in ſilver coin, never in gold, if heavy ſilver can be got; and this again carries away the ſilver coin, and renders it at home ſo rare, that great inconveniencies are found for want of the leſſer denominations of it. The loſs, however, here is confined to an inconvenience; becauſe the balance of trade being a debt which muſt be paid, we do not conſider the exportation of the ſilver for that purpoſe as any conſequence of the diſorder of the coin. But beſides this exportation which is neceſſary, there are others which are arbitrary, and which are made only with a view to profit of the wrong proportion.

When the money jobbers find difficulty in carrying on the traffic we have deſcribed, in the Engliſh market, becauſe of the competition among themſelves, they carry the ſilver coin out of the country, and ſell it abroad for gold, upon the ſame principles that the Eaſt India company ſend ſilver to China, in order to purchaſe gold.

It may be demanded, what hurt this trade can do to England, ſince thoſe who export ſilver bring back the ſame value in gold? Were this trade carried on by natives, there would be no loſs; becauſe they would bring home gold for the whole intrinſic value of the ſilver. But if we ſuppoſe foreigners ſending over gold to be coined at the Engliſh mint, and changing that gold into Engliſh ſilver coin, and then carrying off this coin, it is plain that they muſt gain the difference, as well as the money jobbers. But it may be anſwered, that having given gold for ſilver at the rate of the mint, they have given value for what they have received. Very right; but ſo did Sir Hans Sloane, when he paid five guineas for an overgrown tod: he got value for his money; but it was value only to himſelf. Juſt ſo, whenever the Engliſh government ſhall be obliged to reſtore the proportion of the metals, (as they muſt do,) this operation will annihilate that imaginary value which they have hitherto ſet upon gold; which imagination is the only thing which renders the exchange of their ſilver againſt the foreign gold equal.

But it is farther objected, that foreigners cannot carry off the heavy ſilver; becauſe there is none to carry off. Very true; but then they have carried off a great quantity already: or if the Engliſh Jews have been too ſharp to allow ſuch a profit to fall to ſtrangers, (which may or may not have been the caſe,) then this diſorder is an effectual ſtop to any more coinage of ſilver for circulation.

Of the diſorder in the Britiſh coin, ſo far as it effects the value of the pound ſterling currency.

FROM what has been ſaid, it is evident, that there muſt be found in England two legal pounds ſterling, of different values; the one worth 113 grains of fine gold, the other worth 1718.7 grains of fine ſilver. We call them different; becauſe theſe two portions of the precious metals are of different values all the over Europe.

But beſides theſe two different pounds ſterling, which the change in the proportion of the metals have created, the other defects of the circulating coin produce ſimilar effects. The guineas coined by all the Princes ſince K. Charles II. have been of the ſame ſtandard weight and fineneſs, 44½ in a pound troy of ſtandard gold $\frac{1}{12}$ fine: theſe have been conſtantly wearing ever ſince they have been coined; and in proportion to their wearing they are of leſs value.

If, therefore, the new guineas are below the value of a pound ſterling in ſilver, ſtandard weight, the old muſt be of leſs value ſtill. Here then is another currency, that is, another pound ſterling; or indeed, more properly ſpeaking, there are as many different pounds ſterling, as there are guineas of different weights. This is not all; the money jobbers having carried off all the weighty ſilver, that which is worn with uſe, and reduced even below the ſtandard of gold, forms one currency more, and totally deſtroys all determinate proportion between the money unit and the currencies which are ſuppoſed to repreſent it.

It may be aſked, how, at this rate, any ſilver has remained in England? It is anſwered, that the few weighty ſhillings which ſtill remain in circulation, have marvellouſly eſcaped the hands of the money jobbers; and as for the reſt, the rubbing and wearing of theſe pieces has done

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done what the ſtate might have done; that is to ſay, it has reduced them to their due proportion with the lighteſt gold.

The diſorder, therefore, of the Engliſh coin has rendered the ſtandard of a pound ſterling quite uncertain. To ſay that it is 1718.7 grains of fine ſilver, is quite ideal. Who are paid in ſuch pounds? To ſay that it is 113 grains of pure gold, may alſo not be true; becauſe there are many currencies worſe than the new guineas.

What then is the conſequence of all this diſorder? What effect has it upon the current value of a pound ſterling? And which way can the value of that be determined?

The operations of trade bring value to an equation, notwithſtanding the greateſt irregularities poſſible, and ſo in fact a pound ſterling has acquired a determinate value over all the world by the means of foreign exchange. This is a kind of ideal ſcale for meaſuring the Britiſh coin, although it has not all the properties of that deſcribed above.

Exchange conſiders the pound ſterling as a value determined according to the combination of the values of all the different currencies, in proportion as payments are made in the one or the other; and as debtors generally take care to pay in the worſt ſpecies they can, it conſequently follows, that the value of the pound ſterling ſhould fall to that of the loweſt currency.

Were there a ſufficient quantity of worn gold and ſilver to acquit all bills of exchange, the pound ſterling would come down to the value of them; but if the new gold be alſo neceſſary for that purpoſe, the value of it muſt be proportionally greater.

All theſe combinations are liquidated and compenſated with one another, by the operations of trade and exchange: and the pound ſterling, which is ſo different in itſelf, becomes thereby, in the eyes of commerce, a determinate unit, ſubject however to variations, from which it never can be exempted.

Exchange, therefore, is one of the beſt meaſures for valuing a pound ſterling, preſent currency. Here occurs a queſtion:

Does the great quantity of paper money in England tend to diminiſh the value of the pound ſterling?

We anſwer in the negative. *Paper money* is juſt as good as gold or ſilver money, and no better. The variation of the ſtandard, we have already ſaid, muſt influence the intereſts of debtors and creditors proportionally every where. From this it follows, that all augmentation of the value of the money-unit in the ſpecie muſt hurt the debtors in the paper money; and all diminutions, on the other hand, muſt hurt the creditors in the paper money as well as every where elſe. The payments, therefore, made in paper money, never can contribute to the regulation of the ſtandard of the pound ſterling; it is the ſpecie received in liquidation of that paper money which alone can contribute to mark the value of the Britiſh unit; becauſe it is affixed to nothing elſe.

From this we may draw a principle, "That in countries where the money unit is entirely affixed to the coin, the actual value of it is not according to the legal ſtandard of that coin, but according to the mean proportion of the actual worth of thoſe currencies in which debts are paid.

From this we ſee the reaſon why the exchange between England and all other trading towns in Europe has long appeared ſo unfavourable. People calculate the real par, upon the ſuppoſition that a pound ſterling is worth 1718.7 grains troy of fine ſilver, when in fact the currency is not perhaps worth 1638, the value of a new guinea in ſilver, at the market proportion of 1 to 14.5; that is to ſay, the currency is but 95.3. *per cent* of the ſilver ſtandard of the 43d of Elizabeth. No wonder then if the exchange be thought unfavourable.

From the principle we have juſt laid down, we may gather a confirmation of what we advanced concerning the cauſe of the advanced price of bullion in the Engliſh market.

When people buy bullion with current money at a determinate price, that operation, in conjunction with the courſe of exchange, ought naturally to mark the actual value of the pound ſterling with great exactneſs.

If therefore the price of ſtandard bullion in the Engliſh market, when no demand is found for the exportation of the metals, that is to ſay, when paper is found for paper upon exchange, and when merchants verſed in theſe matters judge exchange (that is, remittances) to be at par, if then, ſilver bullion cannot be bought at a lower price than 65 pence the ounce, it is evident that this bullion might be bought with 65 pence in ſhillings, of which 65 might be coined out of the pound troy Engliſh ſtandard ſilver; ſince 65 per ounce implies 65 ſhillings for the 12 ounces or pound troy.

This plainly ſhews how ſtandard ſilver bullion ſhould ſell for 65 pence the ounce, in a country where the ounce of ſtandard ſilver in the coin is worth no more than 62; and were the market price of bullion to ſtand uniformly at 65 pence *per* ounce, that would ſhew the value of the pound ſterling to be tolerably fixed. All the heavy ſilver coin is now carried off; becauſe it was intrinſically worth more than the gold it paſſed for in currency. The ſilver therefore which remains is worn down to the market proportion of the metals, as has been ſaid; that is to ſay, 20 ſhillings in ſilver currency are worth 113 grains of fine gold, at the proportion of 1 to 14.5 between gold and ſilver. Now,

as 1 is to 14.5, ſo is 113 to 1638.

ſo the 20 ſhillings current weigh but 1638 grains fine ſilver, inſtead of 1718.7, which they ought to do according to the ſtandard.

Now let us ſpeak of ſtandard ſilver, ſince we are examining how far the Engliſh coin muſt be worn by uſe.

The pound troy contains 5760 grains. This, according to the ſtandard, is coined into 62 ſhillings; conſequently, every ſhilling ought to weigh 92.9 grains. Of ſuch ſhillings it is impoſſible that ever ſtandard bullion ſhould ſell at above 62 pence *per* ounce. If therefore ſuch bullion ſells for 65 *pence*, the ſhillings with which it is bought muſt weigh no more than 88.64 grains ſtandard ſilver; that is, they muſt loſe 4.29 grains, and are reduced to $\frac{1}{67}$ of a pound troy.

But it is not neceſſary that bullion be bought with ſhillings; no ſtipulation of *price* is ever made farther, than at ſo many pence ſterling *per* ounce. Does not this virtually determine the value of ſuch currency with re-

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gard to all the currencies in Europe? Did a Spaniard, a Frenchman, or a Dutchman, know the exact quantity of ſilver bullion which can be bought in the London market for a pound ſterling, would he inform himſelf any farther as to the intrinſic value of that money-unit; would he not underſtand the value of it far better from that circumſtance than by the courſe of any exchange, ſince exchange does not mark the intrinſic value of money, but only the value of that money tranſported from one place to another?

The price of bullion, therefore, when it is not influenced by extraordinary demand, (ſuch as for the payment of a balance of trade, or for making an extraordinary proviſion of plate) but when it ſtands at what every body knows to be meant by the common market price, is a very tolerable meaſure of the value of the *actual* money ſtandard in any country.

If it be therefore true, that a pound ſterling cannot purchaſe above 1638 grains of fine ſilver bullion, it will require not a little logic to prove that it is really, or has been for theſe many years, worth any more; notwithſtanding that the ſtandard weight of it in England is regulated by the laws of the kingdom at 1718.7 grains of fine ſilver.

If to this valuation of the pound ſterling drawn from the price of bullion, we add the other drawn from the courſe of exchange; and if by this we find, that when paper is found for paper upon exchange, a pound ſterling cannot purchaſe above 1638 grains of fine ſilver in any country in Europe; upon theſe two authorities we may very ſafely conclude (as to the matter of fact at leaſt) that the pound ſterling is not worth more, either in London or in any other trading city; and if this be the caſe, it is juſt worth 20 ſhillings of 65 to the pound troy.

If therefore the mint were to coin ſhillings at that rate, and pay for ſilver bullion at the market price, that is, at the rate of 65 pence *per* ounce in thoſe new coined ſhillings, they would be in proportion to the gold; ſilver would be carried to the mint equally with gold, and would be as little ſubject to be exported or melted down.

It may be inquired in this place, how far the coining the pound troy into 65 ſhillings is contrary to the laws of England?

The moment a ſtate pronounces a certain quantity of gold to be worth a certain quantity of ſilver, and orders theſe reſpective quantities of each metal to be received as equivalents of each other, and as lawful money in payments, that moment gold is made a ſtandard as much as ſilver. If therefore too ſmall a quantity of gold be ordered or permitted to be conſidered as an equivalent for the unit, the ſilver ſtandard is from that moment debaſed; or indeed, more properly ſpeaking, all ſilver money is from that moment proſcribed; for who, from that time, will ever pay in ſilver, when he can pay cheaper in gold? Gold, therefore, by ſuch a law, is made the ſtandard, and all declarations to the contrary are againſt the matter of fact.

Were the king, therefore, to coin ſilver at 65 ſhillings in the pound, it is demonſtration, *that by ſuch an act* he would commit no adulteration upon the ſtandard: the adulteration is already committed. The ſtandard has deſcended to where it is, by ſlow degrees, and by the operation of political cauſes only; and nothing prevents it from falling lower, but the ſtandard of the gold coin. Let guineas be now left to ſeek their value as they did formerly, and let light ſilver continue to go by tale, we ſhall ſee the guineas up at 30 ſhillings in 20 years time, as was the caſe in 1695.

It is as abſurd to ſay that the ſtandard of Queen Elizabeth has not been debaſed by enacting that the Engliſh unit ſhall be acquitted with 113 grains of fine gold, as it would be to affirm that it would not be debaſed from what it is at preſent by enacting that a pound of butter ſhould every where be received in payment for a pound ſterling; although the pound ſterling ſhould continue to conſiſt of 3 ounces, 17 penny-weights, and 10 grains of ſtandard ſilver, according to the ſtatute of the 43d of Elizabeth. In that caſe moſt debtors would pay in butter, and ſilver would, as at preſent, acquire a conventional value as a metal, but would be looked upon no longer as a ſtandard, or as money.

If therefore, by the law of England, a pound ſterling muſt conſiſt of 1718.7 grains troy of fine ſilver; by the law of England alſo, 113 grains of gold muſt be of the ſame value: but no law can eſtabliſh that proportion; conſequently, in which ever way a reformation be brought about, ſome law muſt be reverſed; conſequently, expediency, and not compliance with law, muſt be the motive in reforming the abuſe.

From what has been ſaid, it is not at all ſurpriſing that the pound ſterling ſhould in fact be reduced nearly to the value of the gold. Whether it ought to be kept at that value is another queſtion. All that we here decide, is, that coining the pound troy into 65 ſhillings would reſtore the proportion of the metals, and render both ſpecies common in circulation. But reſtoring the weight and proportion of the coin is not the difficulty which prevents a reformation of the Engliſh coinage.

Circumſtances to be attended to in a new regulation of the Britiſh coin.

To people who do not underſtand the nature of ſuch operations, it may have an air of juſtice to ſupport the unit at what is commonly believed to be the ſtandard of Queen Elizabeth, to wit, at 1718.5 grains of fine ſilver.

The regulating the ſtandard of both ſilver and gold to $\frac{11}{12}$ fine, and the pound ſterling to four ounces ſtandard ſilver, as it ſtood during the reign of Queen Mary I. has alſo its advantages, as Mr Harris has obſerved. It makes the crown piece to weigh juſt one ounce, the ſhilling four penny weight, and the penny eight grains; conſequently, were the new ſtatute to bear, that the weight of the coin ſhould regulate its currency upon certain occaſions, the having the pieces adjuſted to certain aliquot parts of weight would make weighing eaſy, and would accuſtom the common people to judge of the value of money by its weight, and not by the ſtamp.

In that caſe, there might be a conveniency in ſtriking the gold coins of the ſame weight with the ſilver; becauſe the proportion of their values would then conſtantly be the ſame with the proportion of the metals. The gold crowns would be worth at preſent, 3*l.* 12*s.* 6*d.* the half

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half crowns 1 *l.* 16 *s.* 3 *d.* the gold ſhillings 14 *s.* and 6 *d.* and the half 7 *s.* and 3 *d.* This was anciently the practice in the Spaniſh mints.

The intereſts within the ſtate can be nowiſe perfectly protected but by permitting converſions of value from the old to the new ſtandard, whatever it be, and by regulating the footing of ſuch converſions by act of parliament, according to circumſtances.

For this purpoſe, we ſhall examine thoſe intereſts which will chiefly merit the attention of government, when they form a regulation for the future of acquitting permanent contracts already entered into. Such as may be contracted afterwards will naturally follow the new ſtandard.

The landed intereſt is, no doubt, the moſt conſiderable in the nation. Let us therefore examine, in the firſt place, what regulations it may be proper to make, in order to do juſtice to this great claſs, with reſpect to the land-tax on one hand, and with reſpect to their leſſees on the other.

The valuation of the lands of England was made many years ago, and reaſonably ought to be ſupported at the real value of the pound ſterling at that time, according to the principles already laid down. The general valuation, therefore, of the whole kingdom will riſe according to this ſcheme. This will be conſidered as an injuſtice; and no doubt it would be ſo, if, for the future, the land tax be impoſed as heretofore, without attending to this circumſtance; but as that impoſition is annual, as it is laid on by the landed intereſt itſelf, who compoſe the parliament, it is to be ſuppoſed that this great claſs will at leaſt take care of their own intereſt.

Were the valuation of the lands to be ſtated according to the valuation of the pound ſterling of 1718 7 grains of ſilver, which is commonly ſuppoſed to be the ſtandard of Elizabeth, there would be no great injury done: this would raiſe the valuation only 5 *per cent.* and the land tax in proportion.

There is no claſs of inhabitants in all England ſo much at their eaſe, and ſo free from taxes, as the claſs of farmers. By living in the country, and by conſuming the fruits of the earth without their ſuffering any alienation, they avoid the effect of many exciſes, which, by thoſe who live in corporations, are felt upon *many articles* of their conſumption, as well as on thoſe which are immediately loaded with theſe impoſitions. For this reaſon it will not, perhaps, appear unreaſonable, if the additional 5 *per cent.* on the land tax were thrown upon this claſs, and not upon the landlords.

With reſpect to leaſes, it may be obſerved, that we have gone upon the ſuppoſition that the pound ſterling in the year 1728, was worth 1718.7 grains of fine ſilver, and 113 grains of fine gold.

There would be no injuſtice done the leſſees of all the lands in the kingdom, were their rents to be fixed at the mean proportion of theſe values. We have obſerved how the pound ſterling has been gradually diminiſhing in its worth from that time by the gradual riſe of the ſilver. This mean proportion, therefore, will nearly anſwer to what the value of the pound ſterling was in 1743; ſuppoſing the riſe of the ſilver to have been uniform.

It may be farther alledged in favour of the landlords, that the gradual debaſement of the ſtandard has been more prejudicial to their intereſt in letting their lands, than to the farmers in diſpoſing of the fruits of them. Proprietors cannot ſo eaſily raiſe their rents upon new leaſes, as farmers can raiſe the prices of their grain, according to the debaſement of the value of the currency.

The pound ſterling, thus regulated at the mean proportion of its worth, as it ſtands at preſent, and as it ſtood in 1728, may be realized in 1678.6 grains of fine ſilver, and 115.76 grains fine gold; which is 2.4 *per cent.* above the value of the preſent currency. No injury, therefore, would be done to leſſees, and no unreaſonable gain would accrue to the landed intereſt, in appointing converſions of all land rents at 2½ *per cent.* above the value of the preſent currency.

Without a thorough knowledge of every circumſtance relating to Great Britain, it is impoſſible to lay down any plan. It is ſufficient, here, briefly to point out the principles upon which it muſt be regulated.

The next intereſt to be conſidered is that of the nation's creditors. The right regulation of their concerns will have a conſiderable influence in eſtabliſhing public credit upon a ſolid baſis, by making it appear to all the world, that no political operation upon the money of Great Britain can in any reſpect either benefit or prejudice the intereſt of thoſe who lend their money upon the faith of the nation. The regulating alſo the intereſt of ſo great a body, will ſerve as a rule for all creditors who are in the ſame circumſtances, and will, upon other accounts, be productive of greater advantages to the nation in time coming.

In 1749, a new regulation was made with the public creditors, when the intereſt of the whole redeemable national debt was reduced to 3 *per cent.* This circumſtance infinitely facilitates the matter, with reſpect to this claſs, ſince, by this innovation of all former contracts, the whole national debt may be conſidered as contracted at or poſterior to the 25th of December 1749.

Were the ſtate, by any arbitrary operation upon money, (which every reformation muſt be,) to diminiſh the value of the pound ſterling in which the parliament at that time bound the nation to acquit thoſe capitals and the intereſt upon them, would not all Europe ſay, that the Britiſh parliament had defrauded their creditors? If therefore the operation propoſed to be performed ſhould have a contrary tendency, to wit, to augment the value of the pound ſterling with which the parliament at that time bound the nation to acquit thoſe capitals and intereſts, muſt not all Europe alſo agree, that the Britiſh parliament had defrauded the nation?

This convention with the ancient creditors of the ſtate, who, in conſequence of the debaſement of the ſtandard, might have juſtly claimed an indemnification for the loſs upon their capitals, lent at a time when the pound ſterling was at the value of the heavy ſilver, removes all cauſe of complaint from that quarter. There was in the year 1749, an innovation in all their contracts; and they are now to be conſidered as creditors only from the 25th of December of that year.

Let the value of the pound ſterling be inquired into during one year preceding and one poſterior to the tranſaction

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action of the month of December 1749. The great ſums borrowed and paid back by the nation during that period will furniſh data ſufficient for that calculation. Let this value of the pound be ſpecified in troy grains of fine ſilver and fine gold bullion, without mentioning any denomination of money according to the exact proportion of the metals at that time. And let this pound be called the *pound of national credit*.

This firſt operation being determined, let it be enacted, that the pound ſterling, by which the ſtate is to borrow for the future, and that in which the creditors are to be paid, ſhall be the exact mean proportion between the quantities of gold and ſilver above ſpecified, according to the actual proportion of the metals at the time ſuch payments ſhall be made; or that the ſums ſhall be borrowed or acquitted, one half in gold and one half in ſilver, at the reſpective requiſitions of the creditors or of the ſtate, when borrowing. All debts contracted poſterior to 1749, may be made liable to converſions.

The conſequence of this regulation will be the inſenſible eſtabliſhment of a bank money. Nothing would be more difficult to eſtabliſh, by a poſitive revolution, than ſuch an invariable meaſure; and nothing will be found ſo eaſy as to let it eſtabliſh itſelf by its own advantages. This bank money will be liable to much fewer inconveniences than that of Amſterdam. There the perſons tranſacting muſt be upon the ſpot; here, the ſterling currency may, every quarter of a year, be adjuſted by the exchequer to this invariable ſtandard, for the benefit of all debtors and creditors, who incline to profit of the ſtability of this meaſure of value.

This ſcheme is liable to no inconvenience from the variation of the metals, let them be ever ſo frequent, or hard to be determined; becauſe upon every occaſion where there is the ſmalleſt doubt as to the actual proportion, the option competent to creditors to be paid half in ſilver and half in gold will remove.

Such a regulation will alſo have this good effect, that it will give the nation more juſt ideas of the nature of money, and conſequently of the influence it ought to have upon prices.

If the value of the pound ſterling ſhall be found to have been by accident leſs in December 1749, than it is at preſent; or if at preſent the currency be found below what has commonly been ſince 1749, in juſtice to the creditors, and to prevent all complaints, the nation may grant them the mean proportion of the value of the pound ſterling from 1749 to 1760; or any other which may to parliament appear reaſonable.

This regulation muſt appear equitable in the eyes of all Europe; and the ſtrongeſt proof of it will be, that it will not produce the ſmalleſt effect prejudicial to the intereſt of the foreign creditors. The courſe of exchange with regard to them will ſtand preciſely as before.

A Dutch, French, or German creditor, will receive the ſame value for his intereſt in the Engliſh ſtocks as heretofore. This muſt ſilence all clamours at home, being the moſt convincing proof, that the new regulation of the coin will have made no alteration upon the real value of any man's property, let him be debtor or creditor.

The intereſt of every other denomination of creditors, whoſe contracts are of a freſh date, may be regulated upon the ſame principles. But where debts are of an old ſtanding, juſtice demands, that attention be had to the value of money at the time of contracting. Nothing but the ſtability of the Engliſh coin, when compared with that of other nations, can make ſuch a propoſal appear extraordinary. Nothing is better known in France than this ſtipulation added to obligations, *Argent au cours de ce jour;* that is to ſay, that the ſum ſhall be repaid in coin of the ſame intrinſic value with what has been lent. Why ſhould ſuch a clauſe be thought reaſonable for guarding people againſt arbitrary operations upon the numerary value of the coin, and not be found juſt upon every occaſion where the numerary value of it is found to be changed, let the cauſe be what it will?

The next intereſt we ſhall examine is that of trade. When men have attained the age of twenty one, they have no more occaſion for guardians. This may be applied to traders: they can party with their pen every inconvenience which may reſult to other people from the changes upon money, provided only the laws permit them to do themſelves juſtice with reſpect to their engagements. This claſs demands no more than a right to convert all reciprocal obligations into denominations of coin of the ſame intrinſic value with thoſe they have contracted in.

The next intereſt is that of buyers and ſellers; that is, of manufacturers with regard to conſumers, and of ſervants with reſpect to thoſe who hire their perſonal ſervice.

The intereſt of this claſs requires a moſt particular attention. They muſt, literally ſpeaking, be put to ſchool, and taught the firſt principles of their trade, which is buying and ſelling They muſt learn to judge of price by the grains of ſilver and gold they receive: They are children of a mercantile mother, however warlike the father's diſpoſition may be. If it be the intereſt of the ſtate that their bodies be rendered robuſt and active, it is no leſs the intereſt of the ſtate that their minds be inſtructed in the firſt principle of the trade they exerciſe.

For this purpoſe, tables of converſion from the old ſtandard to the new muſt be made, and ordered to be put up in every market, in every ſhop. All duties, all exciſes, muſt be converted in the ſame manner. Uniformity muſt be made to appear every where. The ſmalleſt deviation from this will be a ſtumbling block to the multitude.

Not only the intereſt of the individuals of the claſs we are at preſent conſidering, demands the nation's care and attention in this particular; but the proſperity of trade, and the well-being of the nation, are alſo deeply intereſted in the execution.

The whole delicacy of the intricate combinations of commerce depends upon a juſt and equable vibration of prices, according as circumſtances demand it. The more therefore the induſtrious claſſes are inſtructed in the principles which influence prices, the more eaſily will the machine move. A workman then learns to ſink his price without regret, and can raiſe it without avidity. When principles ar enot underſtood, prices cannot gently fall, they

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they muſt be pulled down; and merchants dare not ſuffer them to riſe, for fear of abuſe, even although the perfection of an infant manufacture ſhould require it.

The laſt intereſt is that of the bank of England, which naturally muſt regulate that of every other.

Had this great company followed the example of other banks, and eſtabliſhed a bank money of an invariable ſtandard, as the meaſure of all their debts and credits, they would not have been liable to any inconvenience upon a variation of the ſtandard.

The bank of England was projected about the year 1694, at a time when the current money of the nation was in the greateſt diſorder, and government in the greateſt diſtreſs, both for money and for credit. Commerce was then at a very low ebb; and the only, or at leaſt the moſt profitable trade of any, was jobbing in coin, and carrying backwards and forwards the precious metals from Holland to England. Merchants profited alſo greatly from the effects which the utter diſorder of the coin produced upon the price of merchandize.

At ſuch a juncture the reſolution was taken to make a new coinage; and upon the proſpect of this, a company was found, who, for an excluſive charter to hold a bank for 13 years, willingly lent the government upwards of a million ſterling at 8 *per cent.* (in light money we ſuppoſe) with a proſpect of being repaid both intereſt and capital in heavy. This was not all: part of the money lent was to be applied for the eſtabliſhment of the bank; and no leſs than 4000 pounds a year was allowed to the company, above the full intereſt, for defraying the charge of management.

Under ſuch circumſtances the introduction of bank-money was very ſuperfluous, and would have been very impolitic. That invention is calculated againſt the raiſing of the ſtandard; but here the bank profited of that riſe in its quality of creditor for the money lent, and took care not to commence debtor by circulating their paper, until the effect of the new regulation took place in 1695; that is, after the general recoinage of all the clippped ſilver.

From that time till now, the bank of England has been the baſis of the nation's credit, and with great reaſon has been conſtantly under the moſt intimate protection of every miniſter.

The value of the pound ſterling, as we have ſeen, has been declining ever ſince the year 1601, the ſtandard being fixed to ſilver during all that century, while the gold was conſtantly riſing. No ſooner had the proportion taken another turn, and ſilver begun to riſe, than the government of England threw the ſtandard virtually upon the gold, by regulating the value of the guineas at the exact proportion of the market. By theſe operations, however, the bank has conſtantly been a gainer (in its quality of debtor) upon all the paper in circulation; and therefore has loſt nothing by not having eſtabliſhed a bank-money.

The intereſt of this great company being eſtabliſhed upon the principles we have endeavoured to explain, it is very evident, that the government of England never will take any ſtep in the reformation of the coin which in its conſequences can prove hurtful to the bank. Such a ſtep would be contrary both to juſtice and to common ſenſe. To make a regulation which, by raiſing the ſtandard, will prove beneficial to the public creditors, to the prejudice of the bank (which we may call the public debtor) would be an operation upon public credit, like that of a perſon who is at great pains to ſuppport his houſe by props upon all ſides, and who at the ſame time blows up the foundation of it with gun-powder.

We may therefore conclude, that with regard to the bank of England, as well as every other private banker, the notes which are conſtantly payable upon demand muſt be made liable to a converſion at the actual value of the pound ſterling at the time of the new regulation.

That the bank will gain by this, is very certain; but the circulation of their notes is ſo ſwift that it would be abſurd to allow to the then poſſeſſors of them that indemnification which naturally ſhould be ſhared by all thoſe through whoſe hands they have paſſed, in proportion to the debaſement of the ſtandard during the time of their reſpective poſſeſſion.

Beſides theſe conſiderations, which are in common to all ſtates, the government of Great Britain has one peculiar to itſelf. The intereſt of the bank, and that of the creditors, are diametrically oppoſite: every thing which raiſes the ſtandard, hurts the bank; every thing which can ſink it, hurts the creditors: and upon the right management of the one and the other, depends the ſolidity of public credit. For theſe reaſons, without the moſt certain proſpect of conducting a reſtitution of the ſtandard to the general advantage as well as approbation of the nation, no miniſter will probably ever undertake ſo dangerous an operation.

We ſhall now propoſe an expedient which may remove at leaſt ſome of the inconveniences which would reſult from ſo extenſive an undertaking as that of regulating the reſpective intereſts in Great Britain by a poſitive law, upon a change in the value of their money of accompt.

Suppoſe then, that, before any change is made in the coin, government ſhould enter into a tranſaction with the public creditors, and aſcertain a permanent value for the pound ſterling for the future, ſpecified in a determined proportion of the fine metals in common bullion, without any regard to money of accompt, or to any coin whatever.

This preliminary ſtep being taken, let the intended alteration of the ſtandard be proclaimed a certain time before it is to commence. Let the nature of the change be clearly explained, and let all ſuch as are engaged in contracts which are diſſolvable at will upon the preſtations ſtipulated, be acquitted between the parties, or innovated as they ſhall think proper, with certification, that, poſterior to a certain day, the ſtipulations formerly entered into ſhall be binding according to the denominations of the money of accompt in the new ſtandard.

As to permanent contracts, which cannot at once be fulfilled and diſſolved, ſuch as leaſes, the parliament may either preſcribe the methods and terms of converſion; or a liberty may be given to the parties to annul the contract, upon the debtor's refuſing to perform his agreement according to the new ſtandard. Contracts, on the other hand, might remain ſtable, with reſpect to credi-

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tors who would be ſatisfied with payments made on the footing of the old ſtandard. If the riſe intended ſhould not be very conſiderable, no great injuſtice can follow ſuch a regulation.

Annuities are now thoroughly underſtood, and the value of them is brought to ſo nice a calculation, that nothing will be eaſier than to regulate theſe upon the footing of the value paid for them, or of the ſubject affected by them. If by the regulation land-rents are made to riſe in denomination, the annuities charged upon them, ought to riſe in proportion; if in intrinſic value, the annuity ſhould remain as it was.

Regulations which the principles of this inquiry point out as expedient to be made by a new ſtatute for regulating the Britiſh coin.

Let us now examine what regulations it may be proper to make by a new ſtatute concerning the coin of Great Britain, in order to preſerve always the ſame exact value of the pound ſterling realized in gold and in ſilver, in ſpite of all the incapacities inherent in the metals to perform the functions of an invariable ſcale or meaſure of value.

1. The firſt point is to determine the exact number of grains of fine gold and fine ſilver which are to compoſe it, according to the then proportion of the metals in the London market.

2. To determine the proportion of theſe metals with the pound troy, and in regard that the ſtandard of gold and ſilver is different, let the mint price of both metals be regulated according to the pound troy fine.

3. To fix the mint price within certain limits: that is to ſay, to leave to the King and Council, by proclamation, to carry the mint price of bullion up to the value of the coin, as is the preſent regulation, or to ſink it to *per cent.* below that price, according as government ſhall incline to impoſe a duty upon coinage.

4. To order, that ſilver and gold coin ſhall be ſtruck of ſuch denominations as the King ſhall think fit to appoint; in which the proportion of the metals above determined ſhall be conſtantly obſerved through every denomination of the coin, until neceſſity ſhall make a new general coinage unavoidable.

5. To have the number of grains of the fine metal in every piece marked upon the exergue, or upon the legend of the coin, in place of ſome initial letters of titles, which not one perſon in a thouſand can decypher; and to make the coin of as compact a form as poſſible, diminiſhing the ſurface of it as much as is conſiſtent with beauty.

6 That it ſhall be lawful for all contracting parties to ſtipulate their payments either in gold or ſilver coin, or to leave the option of the ſpecies to one of the parties.

7. That where no particular ſtipulation is made, creditors ſhall have power to demand payment, half in one ſpecies, half in the other; and when the ſum cannot fall equally into gold and ſilver coins, the fractions to be paid in ſilver.

8. That in buying and ſelling, when no particular ſpecies has been ſtipulated, and when no act in writing has intervened, the option of the ſpecies ſhall be competent to the buyer.

9. That all ſums paid or received by the King's receivers, or by bankers, ſhall be delivered by weight, if demanded.

10. That all money which ſhall be found under the legal weight, from whatever cauſe it may proceed, may be rejected in every payment whatſoever; or if offered in payment of a debt above a certain ſum, may be taken according to its weight, at the then mint price, in the option of the creditor.

11. That no penalty ſhall be incurred by thoſe who melt down or export the nation's coin; but that waſhing, clipping, or diminiſhing the weight of any part of it ſhall be deemed felony, as much as any other theft, if the perſon ſo degrading the coin ſhall afterwards make it circulate for lawful money.

To prevent the inconveniences proceeding from the variation in the proportion between the metals, it may be provided,

12. That upon every variation of proportion in the market price of the metals, the price of both ſhall be changed, according to the following rule.

Let the price of the pound troy fine gold in the coin be called G.

Let the price of ditto in the ſilver be called S.

Let the new proportion between the market price of the metals be called P.

Then ſtate this formula:

$\frac{G}{2P}+\frac{S}{2}=$ to a pound troy fine ſilver, in ſterling currency.

$\frac{S}{2}+P+\frac{G}{2}=$ to a pound troy fine gold, in ſterling currency.

This will be a rule for the mint, to keep the price of the metals conſtantly at par with the price of the market; and coinage may be impoſed, as has been deſcribed, by fixing the mint price of them at a certain rate below the value of the fine metals in the coin.

13. As long as the variation of the market price of the metals ſhall not carry the price of the riſing metal ſo high as the advanced price of the coin above the bullion, no alteration need be made on the denomination of either ſpecies.

14. So ſoon as the variation of the market price of the metals ſhall give a value to the riſing ſpecies, above the difference between the coin and the bullion; then the king ſhall alter the denominations of all the coin, ſilver and gold, adding to the coins of the riſing metal exactly what is taken from thoſe of the other. An example will make this plain.

Let us ſuppoſe that the coinage has been made according to the proportion of 14 5 to 1; that 20 ſhillings, or 4 crown-pieces, ſhall contain, in fine ſilver, 14.5 times as many grains as the guinea, or the gold pound, ſhall contain grains of fine gold. Let the new proportion of the metals be ſuppoſed to be 14 to 1. In that caſe, the 20 ſhillings, or the 4 crowns, will contain $\frac{1}{10}$ more value than the guinea. Now ſince there is no queſtion of making a new general coinage upon every variation, in order to adjuſt the proportion of the metals in the weight of

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of the coins, that proportion muſt be adjuſted by changing their reſpective denominations according to this formula.

Let the 20 ſhillings, or 4 crowns, in coin, be called S. Let the guinea be callen G. Let the difference between the old proportion and the new, which is $\frac{1}{154}$, be called P. Then ſay,

$S-\frac{P}{2}=$ a pound ſterling, and $G+\frac{P}{2}=$ a pound ſterling.

By this it appears that all the ſilver coin muſt be raiſed in its denomination $\frac{1}{154}$, and all the gold coin muſt be lowered in its denomination $\frac{1}{154}$; yet ſtill S+G will be equal to two pounds ſterling, as before, whether they be conſidered according to the old, or according to the new denominations.

But it may be obſerved, that the impoſition of coinage rendering the value of the coin greater than the value of the bullion, that circumſtance gives a certain latitude in fixing the new denominations of the coin, ſo as to avoid minute fractions. For, providing the deviation from the exact proportion ſhall fall within the advanced price of the coin, no advantage can be taken by melting down one ſpecies preferably to another; ſince, in either caſe, the loſs incurred by melting the coin muſt be greater than the profit made upon ſelling the bullion. The mint price of the metals, however, may be fixed exactly, that is, within the value of a farthing upon a pound of fine ſilver or gold. This is eaſily reckoned at the mint; although upon every piece in common circulation the fractions of farthings would be inconvenient.

15. That notwithſtanding of the temporary variations made upon the denomination of the gold and ſilver coins, all contracts formally entered into, and all ſtipulations in pounds ſhillings and pence, may continue to be acquitted according to the old denominations of the coins, paying one half in gold, and one half in ſilver: unleſs in the caſe where a particular ſpecies has been ſtipulated; in which caſe, the ſums muſt be paid according to the new regulation made upon the denomination of that ſpecies to the end that neither profit or loſs may reſult to any of the parties.

16. That notwithſtanding the alterations on the mint price of the metals, and in the denomination of the coins, no change ſhall be made upon the weight of the particular pieces of the latter, except in the caſe of a general recoinage of one denomination at leaſt: that is to ſay, the mint muſt not coin new guineas, crowns, *&c.* of a different weight from thoſe already in currency, although by ſo doing the fractions might be avoided. This would occaſion confuſion, and the remedy would ceaſe to be of any uſe upon a new change in the proportion of the metals. But it may be found convenient, for removing the ſmall fractions in ſhillings and ſixpences, to recoin ſuch denominations all together, and to put them to their integer numbers, of twelve and of ſix pence, without changing in any reſpect their proportion of value to all other denominations of the coin: this will be no great expence, when the bulk of the ſilver coin is put into 5 ſhilling pieces.

By this method of changing the denominations of the coin, there never can reſult any alteration in the value of the pound ſterling: and although fractions of value may now and then be introduced, in order to prevent the abuſes to which the coin would otherwiſe be expoſed by the artifice of thoſe who melt it down, yet ſtill the inconvenience of ſuch fractions may be avoided in paying, according to the old denominations, in both ſpecies, by equal parts. This will alſo prove demonſtratively, that no change is thereby made in the true value of the national unit of money.

17. That it be ordered, that ſhillings and ſixpences ſhall only be current for twenty years, and all other coins, both gold and ſilver, for forty years, or more. For aſcertaining which term, there may be marked, upon the exergue of the coin, the laſt year of their currency, in place of the date of their fabrication. This term elapſed, or the date effaced, that they ſhall have no more currency whatſoever; and when offered in payment, may be received as bullion at the actual price of the mint, or refuſed at the option of the creditor.

18. That no foreign coin ſhall have any *legal* currency, except as bullion at the mint price.

By theſe or the like regulations may be prevented, 1*mo*, The melting or exporting of the coin in general. 2*do*, The melting or exporting one ſpecies, in order to ſell it as bullion, at an advanced price. 3*tio*, The profit in acquitting obligations preferably in one ſpecies to another. 4*to*, The degradation of the ſtandard, by the wearing of the coin, or by a change in the proportion between the metals. 5*to*, The circulation of the coin below the legal weight. 9*to*. The profit that other nations reap by paying their debts more cheaply to Great Britain than Great Britain can pay hers to them.

And the great advantage of it is, that it is an uniform plan, and may ſerve as a perpetual regulation, compatible with all kinds of denominations of coins, variations in the proportion of the metals, and with the impoſition of a duty upon coinage; or with the preſerving it free; and further, that it may in time be adopted by other nations, who will find the advantage of having their money of accompt preſerved perpetually at the ſame value, with reſpect to the denominations of all foreign money of accomp eſtabliſhed on the ſame principles.

TABLE

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A TABLE OF COINS,

Shewing the Quantity of Fine Metal contained in them.

The number of grains of fine metal in every coin is fought for in the regulations of the mint of the country where it is coined, and is expreſſed in the grains in uſe in that mint. From that weight it is converted into thoſe of other countries, according to the following proportions:

3840 Troy grains, 4676.35 Paris grains, 5192.8 Holland aces or grains, and 4649.06 Colonia grains, are ſuppoſed to be equal weights; and the coins in the Table are converted according to thoſe proportions.

	Table of Coins, reduced to Grains of fine Metal, according to the Troy, Paris, Colonia and Holland weights.	Gold Coins.				Silver Coins.			
		Troy.	Paris.	Colonia.	Holland.	Troy.	Paris.	Colonia	Holland.
Engliſh Coins.	1 A Guinea by ſtatute	118.651	144 46	143 65	160.45				
	2 A Crown by ſtatute	— —	— —	— —	— —	429 68	523.2	520.2	581.
	3 A Shilling by ſtatute	— —	— —	— —	— —	85.935	104.65	104.	116.2
	4 A Silver Pound ſterling by ſtatute 1601	— —	— —	— —	— —	1718.7	2093.	2080.8	2324.1
	5 A Gold Pound ſterling by ſtatute 1728	113.	137.61	126.8	152.8				
	6 A Silver Pound ſterling in currency = $\frac{20}{67}$ lib. Troy	— —	— —	— —	— —	1639.38	1996.4	1984.7	2216.
	7 A Silver Pound ſterl. at the proportion of gold to ſilver as 1 to $14\frac{1}{2}$	113.	137.61	136.8	152.8	1638.5	1995.3	1983 7	2215.7
	8 A Gold Pound ſterling at the ſame proportion of 1 to $14\frac{1}{2}$	118 4	144 18	143.34	160.11	1718.7	2093.	2080.8	2324.1
	9 A Pound ſterling at the mean proportion in gold and in ſilver	115.769	140.98	140 16	156.55	1678.6	2044 2	2032.2	2269.9
	10 A Shilling current = $\frac{1}{67}$ of a pound Troy	— —	— —	— —	— —	81.961	99 8	99.	110.82
	11 A Guinea in ſilver, or 21 Shillings ſtandard weight	— —	— —	— —	— —	1804.6	2197.6	2184.8	2440.3
	12 A Guinea at the proportion of 1 to $14\frac{1}{2}$, worth in ſilver	— —	— —	— —	— —	1720.4	2095.1	2082.8	2326.4
	13 A Pound Troy, or 12 ounces Engliſh weight	5760.	7019.2	6973 5	7789.2				
French Coins.	1 A Louis d'or	113.27	137.94	137 13	153.17				
	2 A Crown of ſix livres	— —	— —	— —	— —	409.94	499.22	496.3	554.3
	3 A Crown of three ditto	— —	— —	— —	— —	204 97	249.61	248 15	277.1
	4 A Livre	— —	— —	— —	— —	68 34	83.23	82.74	92.42
	5 A Louis d'or, or 24 livres in ſilver	— —	— —	— —	— —	1639.7	1996.9	1985.2	2217.4
	6 A Marc of Paris weight, fine gold or ſilver	3783.87	4608.	4581.1	5116 9	3783.87	4608.	4581.1	5116.9
	7 A Marc of gold coin effective weight, in fine	3398.3	4138 5	4114.3	4593.4				
	8 A Marc of ſilver coin effective weight, in fine	— —	— —	— —	— —	3402.3	4143.4	4119.2	4600.9
German Coins.	1 A Carolin legal weight	115.45	140.6	139.78	156.12				
	2 A Ducat of the Empire ditto	52.8	64.37	64.	71.48				
	3 A Florin of Convention	— —	— —	— —	— —	179.73	218.87	217.6	243.
	4 A Dollar of Convention	— —	— —	— —	— —	269.59	328.31	326.4	364.5
	5 A Dollar of Exchange, the Carolin = 9 flor. 42 kreutzers	17.85	21.74	21.615	24.14				
	6 A Florin current = $\frac{1}{11}$ of a Carolin	10.54	12.84	12.77	14.26				
	7 A Carolin in ſilver, at the proportion of 1 to $14\frac{1}{2}$	— —	— —	— —	— —	1674.	2038.6	2026.8	2263.8
Dutch Coins.	1 A Dutch Ducat	51.76	63.	62.67	70.				
	2 A Florin in ſilver	— —	— —	— —	— —	148.	180.3	179.2	200.21

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MONK, a perſon who wholly dedicates himſelf to the ſervice of religion, in ſome monaſtery, under the direction of ſome particular ſtatutes and rules.

The moſt probable account of the original of the monks is, that in the Decian perſecution, in the middle of the IIId century, many perſons in Egypt, to avoid the fury of the ſtorm, fled to the neighbouring deſarts and mountains, where they not only found a ſafe retreat, but alſo more time and liberty to exerciſe themſelves in acts of piety and divine contemplations; which ſort of life became ſo agreeable, that when the perſecution was over, they refuſed to return to their habitations again, chuſing rather to continue in thoſe cottages and cells, which they had made for themſelves in the wilderneſs. From that time to the reign of Conſtantine, monachiſm was confined to the hermits or anachorets, who lived in private cells in the wilderneſs; but when Pachomius had erected monaſteries, other countries preſently followed the example.

MONKEY, in zoology. See SIMIA.

MONMOUTH, the capital of Monmouth-ſhire, ſituated on the river Wye, twenty-five miles north of Briſtol.

MONOCHORD, a muſical inſtrument, compoſed of one ſtring, uſed to try the variety and proportion of ſounds.

MONOCULUS, in zoology, a genus of the order of aptera. The feet are fitted for ſwimming; the body is covered with a cruſtaceous ſkin; and the eyes are very near each other. There are nine ſpecies.

MONODON, in ichthyology, a genus of fiſhes belonging to the order of bete. It has a long wreathed tooth in the upper jaw, which perforates the upper-lip, and has the appearance of a horn; from this circumſtance it has got the name of the unicorn-fiſh. This fiſh is of the whale kind, and often grows to 25 feet in length, though the general ſize is from 16 to 20.

MONODY, in ancient poetry, a mournful kind of ſong, ſung by a perſon all alone, to give vent to his grief.

MONOECIA, in botany See BOTANY, p. 635.

MONOGAMY, the ſtate or condition of thoſe who have only been once married, and are reſtrained to a ſingle wife.

MONOGRAM, a character or cypher, compoſed of one, two, or more letters, interwoven; being a kind of abbreviation of a name, anciently uſed as a ſeal, badge, arms, *&c.*

MONOLOGUE, in poetry, a dramatic ſcene, in which a perſon appears alone on the ſtage, and ſpeaks to himſelf.

MONOMOTOPA, a country of Africa, bounded by Monemugi on the north, and by Cafraria on the eaſt, ſouth, and weſt.

MONOPETALOUS, in botany, a term applied to flowers that have only one petal, or flower-leaf.

MONOPOLI, a town in the kingdom of Naples, ſituated on the gulph of Venice: E. long. 18°, and N. lat. 41° 5′.

MONOPOLY, one or more perſons making themſelves the ſole maſters of the whole of a commodity, manufacture, and the like, in order to make private advantage of it, by ſelling it again at a very advanced price.

MONOPYRENEOUS, in botany, ſuch fruit as contains only one ſeed, or kernel.

MONOSTICH, an epigram that conſiſts of only one ſingle verſe.

MONOSYLLABLE, in grammar, a word that conſiſts of only one ſyllable, and is compoſed of either one or more letters pronounced at the ſame time.

MONOTONY, an uniformity of ſound, or a fault in pronunciation, when a long ſeries of words are delivered in one unvaried tone.

MONOTROPA, in botany, a genus of the decandria monogynia claſs. It has no calix; the petals are ten; and it has five capſules. There are two ſpecies, one of which, *viz.* the hypopithys, or bird's neſt ſmelling like the roots of the primroſe, is a native of Britain.

MONS, the capital of the province of Hainalt, in the Auſtrian Netherlands: ſituated twenty-ſix miles ſouth-weſt of Bruſſels: eaſt long. 3° 33′, and ſouth lat. 50° 34′.

MONSIEUR, a title of civility uſed by the French, in ſpeaking to, or of their equals, or thoſe that are but a little below them, ſynonimous with SIR in Engliſh.

MONSOON, in phyſiology, a ſpecies of trade wind, in the Eaſt-Indies, which for ſix months blows conſtantly the ſame way, and the contrary way the other ſix months. See PNEUMATICS, *Of Winds.*

MONSTER, in general, denotes any production that deviates from the ſpecies to which it belongs, whether with reſpect to the number or diſpoſition of its parts; in which ſenſe, a man with ſix fingers on each hand, or ſix toes on each foot, is a monſter. But the term monſter ſeems to be chiefly applied to ſuch productions as deviate very much from the ordinary courſe of nature.

MONTE SANCTO, or MOUNT-ATHOS, a mountain of European Turky, in the province of Macedon: E. long. 23°, and N. lat 40° 12′.

It is called Monte Sancto, or Holy Mountain, from twenty two monaſteries ſituated upon it, in which are four thouſand monks or friars, who never ſuffer a woman to come within ſight of their convent.

MONTFERRAT, a duchy in Italy, bounded by the lordſhip of Verceil on the north, by the Alexandrin on the eaſt, by the territory of Genoa on the ſouth, and by the county of Aſti on the weſt.

MONTFORT, the capital of the county of Montfort, in the circle of Swabia, in Germany: E. long. 9° 40′, and N lat. 47° 15′.

MONTGOMERY, the capital of Montgomeryſhire, in Wales, ſituated on the river Severn, twenty miles ſouth-weſt of Shrewſbury.

MONTH, the twelfth part of a year. See ASTRONOMY.

MONTIA, in botany, a genus of the triandria trigynia claſs. The calix conſiſts of one leaf, and the corolla of one irregular petal; and the capſule has one cell and three valves. There is but one ſpecies, *viz.* the ſentana, or water chickweed, a native of Britain.

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MONTIFRINGILLA, in zoology. See FRINGILLA.

MONTPELIER, a city of France, in the province of Languedoc and county of Niſmes, ſituated on the little river Lez, fifty miles north-eaſt of Narbonne, and forty-five miles ſouth-weſt of Avignon; a place famous for its delightful ſituation, and its healthy ſerene air.

MONTREAL, a city of Sicily, in the province of Mazara, ſituated near the ſea, five miles eaſt of Palermo.

MONTREAL is alſo a town of Canada, in North America, ſituated on the river of St Laurence, one hundred miles ſouth of Quebec.

MONTROSE, a town of North Britain, in the ſhire of Angus, ſituated at the mouth of the river Eſk, on the German ocean, forty-ſix miles north-eaſt of Edinburgh.

Steel ſpaws are very numerous in the country about Montroſe; beſides theſe, there is a well near this town whoſe water is of a whitiſh colour, ſoft taſte, and faintly diſcovering a mineral quality, and is of a different nature from the ſteel one. It is univerſally diuretic; and has been found uſeful in ſtranguries, ſtoppages of urine, ſcorbutic diſorders, flatulencies, &c.

MONTSERAT, a mountain of Spain, in the province of Catalonia, twenty-one miles north-weſt of Barcelona, where there is a monaſtery and chapel dedicated to the Virgin Mary, to which there is a great reſort of pilgrims.

MONTSERAT is alſo one of the ſmalleſt of the Caribbee iſlands; it is ſituated about thirty miles ſouth-weſt of Antigua.

MONUMENT, in architecture, a building deſtined to preſerve the memory, &c. of the perſon who raiſed it, or for whom it was raiſed; ſuch are a triumphal arch, a mauſoleum, a pyramid, &c.

MOOD, or MODE. See LOGIC and METAPHYSICS.

MOOD, or MODE, in grammar, the different manner of conjugating verbs. See GRAMMAR.

MOON, in aſtronomy. See ASTRONOMY, p. 440.

MOON-WORT, in botany. See LUNARIA.

MOOR, in country affairs, denotes an unlimited tract of land, uſually over-run with heath.

MOOR-BUZZARD. See FALCO.

MOOR-COCK, or GOR-COCK. See TETRAO.

MOOR-STONE, a valuable ſtone, much uſed in the coarſer works of the preſent builders; being truly a white granite, of a marbly texture.

MOORING, or MOARING, in the ſea language, is the laying out the anchors of a ſhip in a place where ſhe can ride ſecure.

MORAL, ſomething belonging to manners, or the conduct of life. See——

MORAL PHILOSOPHY, OR MORALS.

MORAL PHILOSOPHY is "The ſcience of MANNERS OR DUTY; which it traces from man's "nature and condition, and ſhews to terminate in his happineſs." In other words, it is "The knowledge of "our DUTY and FELICITY;" or, "The art of being "VIRTUOUS and HAPPY."

It is denominated an art, as it contains a ſyſtem of rules for becoming virtuous and happy. Whoever practiſes theſe rules, attains an habitual power or facility of becoming virtuous and happy. It is likewiſe called a ſcience, as it deduces thoſe rules from the principles and connexions of our nature, and proves that the obſervance of them is productive of our happineſs.

It is an art, and a ſcience, of the higheſt dignity, importance, and uſe. Its object is man's duty, or his conduct in the ſeveral moral capacities and connections which he ſuſtains. Its office is to direct that conduct; to ſhew whence our obligations ariſe, and where they terminate. Its uſe, or end, is the attainment of happineſs; and the means it employs are rules for the right conduct of our moral powers.

Moral Philoſophy has this in common with Natural Philoſophy, that it appeals to nature or fact; depends on obſervation; and builds its reaſonings on plain uncontroverted experiments, or upon the fulleſt induction of particulars of which the ſubject will admit. We muſt obſerve, in both theſe ſciences, how nature is affected, and what her conduct is in ſuch and ſuch circumſtances. Or, in other words, we muſt collect the appearances of nature in any given inſtance; trace theſe to ſome general principles, or laws of operation; and then apply theſe principles or laws to the explaining of other phænomena.

Therefore Moral Philoſophy inquires, not how man might have been, but how he is, conſtituted: not into what principles or diſpoſitions his actions may be artfully reſolved; but from what principles and diſpoſitions they actually flow: not what he may, by education, habit, or foreign influence, come to be, or do; but what, by his nature, or original conſtituent principles, he is formed to be and do. We diſcover the office, uſe, or deſtination of any work, whether natural or artificial, by obſerving its ſtructure, the parts of which it conſiſts, their connection or joint action. It is thus we underſtand the office and uſe of a watch, a plant, an eye, or hand. It is the ſame with a living creature, of the rational, or brute kind. Therefore, to determine the office, duty, or deſtination of man; or, in other words, what his buſineſs is, or what conduct he is obliged to purſue; we muſt inſpect his conſtitution, take every part to pieces, examine their mutual relations one to the other, and the common effort or tendency of the whole.

Of Man and his connections.

MAN is born a weak, helpleſs, delicate creature; unprovided with food, cloathing, and whatever elſe is neceſſary for ſubſiſtence, or defence. And yet, expoſed as the

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the infant is to numberleſs wants and dangers, he is utterly incapable of ſupplying the former, or ſecuring himſelf againſt the latter. But, though thus feeble and expoſed, he finds immediate and ſure reſources in the affection and care of his parents, who refuſe no labours, and forego no dangers, to nurſe and rear up the tender babe. By theſe powerful inſtincts, as by ſome mighty chain, does nature link the parent to the child, and form the ſtrongeſt moral connection on his part, before the child has the leaſt apprehenſion of it. Hunger and thirſt, with all the ſenſations that accompany or are connected with them, explain themſelves by a language ſtrongly expreſſive, and irreſiſtibly moving. As the ſeveral ſenſes bring in notices and informations of ſurrounding objects, we may perceive in the young ſpectator early ſigns of a growing wonder and admiration. Bright objects and ſtriking ſounds are beheld and heard with a ſort of commotion and ſurpriſe. But without reſting on any, he eagerly paſſes on from object to object, ſtill pleaſed with whatever is moſt new. Thus the love of novelty is formed, and the paſſion of wonder kept awake. By degrees he comes acquainted with the moſt familiar objects, his parents, his brethren, and thoſe of the family who are moſt converſant with him. He contracts a fondneſs for them; is uneaſy when they are gone, and charmed to ſee them again. Theſe feelings become the foundation of a moral attachment on his ſide; and by this reciprocal ſympathy he forms the domeſtic alliance with his parents, brethren, and other members of the family. Hence he becomes intereſted in their concerns; and feels joy or grief, hope or fear, on their account, as well as his own. As his affections now point beyond himſelf to others, he is denominated a good or ill creature, as he ſtands well or ill affected to them. Theſe then are the firſt links of the moral chain, the early rudiments or outlines of his character, his firſt rude eſſays towards agency, freedom, manhood.

When he begins to make excurſions from the nurſery, and extend his acquaintance abroad, he forms a little circle of companions, engages with them in play or in queſt of adventures, and leads or is led by them as his genius is more or leſs aſpiring. Though this is properly the ſeaſon in which appetite and paſſion have the aſcendant, yet his imagination and intellectual powers open apace: and as the various images of things paſs before the mental eye, he forms a variety of taſtes; reliſhes ſome things and diſlikes others, as his parents, companions, and a thouſand other circumſtances, lead him to combine agreeable or diſagreeable ſets of ideas, or repreſent to him objects in alluring or odious lights.

As his views are enlarged, his active and ſocial powers expand themſelves in proportion; the love of action, of imitation, and of praiſe, emulation, curioſity, docility, a paſſion for command, and fondneſs of change. His paſſions are quick, variable, and pliant to every impreſſion; his attachments and diſguſts quickly ſucceed each other. He compares things, diſtinguiſhes actions, judges of characters, and loves or hates them as they appear well or ill affected to himſelf or to thoſe he holds dear. Mean while, he ſoon grows ſenſible of the conſequences of his own actions, as they attract applauſe, or bring contempt; he triumphs in the former, and is aſhamed of the latter, wants to hide them, and bluſhes when they are diſcovered. By means of theſe powers, he becomes a fit ſubject of culture, the moral tie is drawn cloſer, he feels that he is accountable for his conduct to others as well as to himſelf, and thus is gradually ripening for ſociety and action.

As man advances from childhood to youth, his paſſions as well as perceptions take a more extenſive range. New ſenſes of pleaſure invite him to new purſuits; he grows ſenſible to the attractions of beauty, feels a peculiar ſympathy with the ſex, and forms a more tender kind of attachment than he has yet experienced. This becomes the cement of a new moral relation, and gives a ſofter turn to his paſſions and behaviour. In this turbulent period he enters more deeply into a reliſh of friendſhip, company, exerciſes, and diverſions; the love of truth, of imitation and of deſign, grows upon him; and as his connections ſpread among his neighbours, fellow citizens, and countrymen, his thirſt of praiſe, emulation, and ſocial affections grow more intenſe and active. Mean while it is impoſſible for him to have lived thus long without having become ſenſible of thoſe more auguſt ſignatures of order, wiſdom, and goodneſs, which are ſtamped on the viſible creation; and of thoſe ſtrong ſuggeſtions within himſelf of a parent mind, the ſource of all intelligence and beauty, and the object as well as ſource of that activity and thoſe aſpirations which ſometimes rouze his inmoſt frame and carry him out of himſelf to an all-mighty and all-governing Power: Hence ariſe thoſe ſentiments of reverence, and theſe affections of gratitude, reſignation, and love, which link the ſoul with the Author of nature, and form that moſt ſublime and godlike of all connections.

Man having now reached his prime, either new paſſions ſucceed, or the old ſet are wound up to an higher pitch. For, growing more ſenſible of his connection with the public, and that particular community to which he more immediately belongs; and taking withal a larger proſpect of human life, and its various wants and enjoyments; he forms more intimate friendſhips, graſps at power, courts honour, lays down cooler plans of intereſt, and becomes more attentive to the concerns of ſociety; he enters into family connections, and indulges thoſe charities which ariſe from thence. The reigning paſſions of this period powerfully prompt him to provide for the decays of life; and in it compaſſion and gratitude exert their influence in urging the man, now in full vigour, to requite the affection and care of his parents, by ſupplying their wants and alleviating their infirmities.

At length human life verges downwards; and old age creeps on apace, with its anxiety, love of eaſe, intereſtedneſs, fearfulneſs, foreſight, and love of offſpring. The experience of the aged is formed to direct, and their coolneſs to temper, the heat of youth: the former teaches them to look back on paſt follies; and the latter to look forward into the conſequences of things, and provide againſt the worſt. Thus every age has its peculiar genius and ſet of paſſions, correſponding to that period, and moſt conducive to the proſperity of the reſt. And thus are the

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the wants of one period ſupplied by the capacities of another, and the weakneſſes of one age tally to the paſſions of another.

Beſides theſe, there are other paſſions and affections of a leſs ambulatory nature; not peculiar to one period, but belonging to every age, and acting more or leſs in every breaſt throughout life: ſuch are, ſelf love, benevolence, love of life, honour, ſhame, hope, fear, deſire, averſion, joy, ſorrow, anger, and the like. The two firſt are affections of a cooler ſtrain; one pointing to the good of the individual, the other to that of the ſpecies: joy, and ſorrow, hope and fear, ſeem to be only modifications, or different exertions of the ſame original affections of love and hatred, deſire and averſion, ariſing from the different circumſtances or poſition of the object deſired or abhorred, as it is preſent or abſent. From theſe likewiſe ariſe other ſecondary, or occaſional paſſions, which depend, as to their exiſtence and ſeveral degrees, upon the original affections being gratified or diſappointed; as, anger, complacence, confidence, jealouſy, love, hatred, dejection, exultation, contentment, diſguſt, which do not form leading paſſions, but rather hold of them.

By theſe ſimple, but powerful ſprings, whether periodical or fixed, the life of man, weak and indigent as he is, is preſerved and ſecured; and the creature is prompted to a conſtant round of action, even to ſupply his own numerous and ever-returning wants, and to guard againſt the various dangers and evils to which he is obnoxious. By theſe links, men are connected with each other, formed into families, drawn into particular communities, and all united, as by a common league, into one ſyſtem or body, whoſe members feel and ſympathize one with another. By this admirable adjuſtment of the conſtitution of man to his ſtate, and the gradual evolution of his powers, order is maintained, ſociety upheld, and human life filled with that variety of paſſion and action, which at once enliven and diverſify it.

This is a ſhort ſketch of the principal movements of the human mind. Yet theſe movements are not the whole of man: they impel to action, but do not direct it; they need a regulator to guide their motions, to meaſure and apply their forces. And accordingly they have one that naturally ſuperintends and directs their action. We are conſcious of a principle within us, which examines, compares, and weighs things; notes the differences, obſerves the forces, and forſees the conſequences of affections and actions. By this power we look back on paſt times, and forward into futurity, gather experiences, eſtimate the real and comparative value of objects, lay out ſchemes, contrive means to execute them, and ſettle the whole order and œconomy of life. This power we commonly diſtinguiſh by the name of reaſon, or reflection; the buſineſs of which is, not to ſuggeſt any original notices or ſenſations, but to canvaſs, range, and make deductions from them.

We are intimately conſcious of another principle within us, which approves of certain ſentiments, paſſions, and actions, and diſapproves of their contraries. In conſequence of the deciſions of this inward judge, we denominate ſome actions and principles of conduct *right*, *honeſt*, *good*; and others *wrong*, *diſhoneſt*, *ill*. The former excite our eſteem, moral complacence, and affection, immediately and originally of themſelves, without regard to their conſequences, and whether they affect our intereſt or not. The latter do as naturally and neceſſarily call forth our contempt, ſcorn, and averſion. That power, by which we perceive this difference in affections and actions, and feel a conſequent reliſh or diſlike, is commonly called conſcience, or the moral ſenſe. Whether ſuch a power belongs to human nature or not, muſt be referred to every one's experience of what paſſes within himſelf.

Theſe two powers of reaſon and conſcience, are evidently principles different in nature and kind from the paſſions and affections. For the paſſions are mere force or power, blind impulſes, acting violently and without choice, and ultimately tending each to their reſpective objects, without regard to the intereſt of the others, or of the whole ſyſtem: Whereas the directing and judging powers diſtinguiſh and aſcertain the different forces, mutual proportions, and relations, which the paſſions bear to each other and to the whole; recognize their ſeveral degrees of merit; and judge of the whole temper and conduct, as they reſpect either the individual or the ſpecies; and are capable of directing or reſtraining the blind impulſes of paſſion in a due conſiſtency one with the other, and a regular ſubordination to the whole ſyſtem.

This is ſome account of the conſtituent principles of our nature, which, according to their different mixtures, degrees, and proportions, mould our character, and ſway our conduct in life. In reviewing that large train of affections which fill up the different ſtages of human life, we perceive this obvious diſtinction among them; that ſome of them reſpect the good of the individual, and others carry us beyond ourſelves to the good of the ſpecies, or kind. The former have therefore been called private, and the latter public affections. Of the firſt ſort are love of life, of pleaſure, of power, and the like. Of the laſt are compaſſion, gratitude, friendſhip, natural affection, and the like. Of the private paſſions, ſome reſpect merely the ſecurity and defence of the creature; ſuch as reſentment, and fear: whereas others aim at ſome poſitive advantage or good; as wealth, eaſe, fame. The former ſort therefore, becauſe of this difference of objects, may be termed defenſive paſſions. Theſe anſwer to our dangers, and prompt us to avoid them if we can, or boldly to encounter them when we cannot.

The other claſs of private paſſions, which purſue private poſitive good, may be called appetitive. However, we ſhall ſtill retain the name of private, in contradiſtinction to the defenſive paſſions. Man has a great variety of wants to ſupply, and is capable of many enjoyments, according to the ſeveral periods of his life, and the different ſituations in which he is placed. To theſe, therefore, a ſuitable train of private paſſions correſpond, which engage him in the purſuit of whatever is neceſſary for his ſubſiſtence or welfare.

Our public or ſocial affections are adapted to the ſeveral ſocial connections and relations which we bear to others, by making us ſenſible of their dangers, and intereſting us in their wants, and ſo prompting us to ſecure them againſt one, and ſupply the other.

This is the firſt ſtep then to diſcover the duty and deſtination

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ſtination of man, the having analyzed the principles of which he is compoſed. It is neceſſary, in the next place, to conſider in what order, proportion, and meaſure of thoſe inward principles, virtue, or a ſound moral temper and right conduct, conſiſts; that we may diſcover whence moral obligations ariſe.

Of Duty, or Moral Obligation.

It is by the end or deſign of any power or movement, that we muſt direct it motions, and eſtimate the degree of force neceſſary to its juſt action. If it want the force requiſite for the obtaining its end, we reckon it defective; if it has too much, ſo as to be carried beyond it, we ſay it is over-charged; and in either caſe it is imperfect, and ill contrived. If it has juſt enough to reach the ſcope, we eſteem it right, and as it ſhould be. Let us apply this reaſoning to the paſſions.

The defence and ſecurity of the individual being the aim of the defenſive paſſions, that ſecurity and defence muſt be the meaſure of their ſtrength or indulgence. If they are ſo weak as to prove inſufficient for that end, or if they carry us beyond it, *i. e.* raiſe unneceſſary commotions, or continue longer than is needful, they are unfit to anſwer their original deſign, and therefore are in an unſound and unnatural ſtate. The exerciſe of fear or of reſentment has nothing deſirable in it, nor can we give way to either without painful ſenſations. Without a certain degree of them, we are naked and expoſed: with too high a proportion of them, we are miſerable, and often injurious to others. Thus cowardice or timidity, which is the exceſs of fear, inſtead of ſaving us in danger, gives it too formidable an appearance, makes us incapable of attending to the beſt means of preſervation, and diſarms us of courage our natural armour. Fool-hardineſs, which is the want of a due meaſure of fear, leads us heedleſly into danger, and lulls us into a pernicious ſecurity. Revenge, *i. e.* exceſſive reſentment, by the violence of its commotion, robs us of that preſence of mind which is often the beſt guard againſt injury, and inclines us to purſue the aggreſſor with more ſeverity than ſelf-defence requires. Puſillanimity, or the want of a juſt indignation againſt wrong, leaves us quite unguarded, and tends to ſink the mind into a paſſive enervated tameneſs. Therefore, "to keep the defenſive paſſions duly proportioned to our dangers, is their natural pitch and tenor."

The private paſſions lead us to purſue ſome poſitive ſpecies of private good. That good, therefore, which is the object and end of each, muſt be the meaſure of their reſpective force, and direct their operation. If they are too weak or ſluggiſh to engage us in the purſuit of their ſeveral objects, they are evidently deficient; but if they defeat their end by their impetuoſity, then are they ſtrained beyond the juſt tone of nature. Thus vanity, or an exceſſive paſſion for applauſe, betrays into ſuch meanneſſes and little arts of popularity, as makes us forfeit the honour we ſo anxiouſly court. On the other hand, a total indifference about the eſteem of mankind, removes a ſtrong guard and ſpur to virtue, and lays the mind open to the moſt abandoned proſecutions. Therefore, "to keep our private paſſions and deſires proportioned to our wants, is the juſt meaſure and pitch of this claſs of affections."

The defenſive and private paſſions do all agree in general in their tendency or conduciveneſs to the intereſt or good of the individual. Therefore, when there is a colliſion of intereſts, as may ſometimes happen, that aggregate of good or happineſs, which is compoſed of the particular goods to which they reſpectively tend, muſt be the common ſtandard by which their comparative degrees of ſtrength are to be meaſured. That is to ſay, if any of them, in the degree in which they prevail, are incompatible with the greateſt aggregate of good, or moſt extenſive intereſt of the individual, then are they unequal and diſproportionate. For, in judging of a particular ſyſtem or conſtitution of powers, we call that the ſupreme or principal end, in which the aims of the ſeveral parts or powers coincide, and to which they are ſubordinate; and reckon them in due proportion to each other, and right with regard to the whole, when they maintain that ſubordination or ſubſerviency. Therefore, "to proportion our defenſive and private paſſions in ſuch meaſure to our dangers and wants, as beſt to ſecure the individual, and obtain the greateſt aggregate of private good or happineſs, is their juſt balance or comparative ſtandard in caſe of competition."

In like manner, as the public or ſocial affections point at the good of others, that good muſt be the meaſure of their force. When a particular ſocial affection, as gratitude or friendſhip, which belongs to a particular ſocial connection, *viz.* that of a benefactor or of a friend, is too feeble to make us act the grateful or friendly part; that affection, being inſufficient to anſwer its end, is defective and unſound. If, on the other hand, a particular paſſion of this claſs counteract or defeat the intereſt it is deſigned to promote, by its violence or diſproportion, then is that paſſion exceſſive and irregular. Thus natural affection, if it degenerates into a paſſionate fondneſs, not only hinders the parents from judging coolly of the intereſt of their offspring, but often leads them into a moſt partial and pernicious indulgence.

As every kind affection points at the good of its particular object, it is poſſible there may be ſometimes a colliſion of intereſts or goods. Thus the regard due to a friend may interfere with that which we owe to a community. In ſuch a competition of intereſts, it is evident, that the greateſt is to be choſen; and that is the greateſt intereſt, which contains the greateſt ſum or aggregate of public good, greateſt in quantity as well as duration. This then is the common ſtandard, by which the reſpective forces and ſubordinations of the ſocial affections muſt be adjuſted. Therefore we conclude, that this "claſs of affections are ſound and regular, when they prompt us to purſue the intereſt of individuals in an entire conſiſtency with the public good:" or, in other words, "when they are duly proportioned to the dangers and wants of others, and to the various relations in which we ſtand to individuals, or to ſociety."

Thus we have found, by an induction of particulars, the natural pitch or tenor of the different orders of affection, conſidered apart by themſelves. Now as the virtue or perfection of every creature lies in following its nature,

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or acting ſuitably to the juſt proportion and harmony of its ſeveral powers; therefore, "the virtue of a creature endowed with ſuch affections as man, muſt conſiſt in obſerving or acting agreeably to their natural pitch and tenor."

But, as there are no independent affections in the fabrick of the mind, no paſſion that ſtands by itſelf without ſome relation to the reſt, we cannot pronounce of any one, conſidered apart, that it is either too ſtrong or too weak. Its ſtrength and juſt proportion muſt be meaſured, not only by its ſubſerviency to its own immediate end, but by the reſpect it bears to the whole ſyſtem of affection. Therefore, we ſay a paſſion is too ſtrong, not only when it defeats its own end, but when it impairs the force of other paſſions, which are equally neceſſary to form a temper of mind ſuited to a certain œconomy or ſtate; and too weak, not merely on account of its inſufficiency to anſwer its end, but becauſe it cannot ſuſtain its part or office in the balance of the whole ſyſtem. Thus the love of life may be too ſtrong, when it takes from the regard due to one's country, and will not allow one bravely to encounter dangers, or even death, on its account: Again, the love of fame may be too weak, when it throws down the fences which render virtue more ſecure, or weakens the incentives which make it more active and publick-ſpirited.

If it be aſked, "How far may the affections towards private good or happineſs be indulged?" one limit was before fixed for the particular indulgencies of each, *viz.* their ſubordination to the common aggregate of good to the private ſyſtem. In theſe therefore, a due regard is always ſuppoſed to be had to health, reputation, fortune, the freedom of action, the unimpaired exerciſe of reaſon, the calm enjoyment of one's ſelf, which are all private goods. Another limit now reſults from the balance of affection juſt named, *viz.* "The ſecurity and happineſs of others;" or, to expreſs it more generally, "a private affection may be ſafely indulged, when, by that indulgence, we do not violate the obligations which reſult from our higher relations, or public connections." A juſt reſpect therefore being had to theſe boundaries, which nature has fixed in the breaſt of every man, What ſhould limit our purſuits of private happineſs? Is nature ſullen and penurious? Or does the God of nature envy the happineſs of his offſpring?

Whether there is ever a real colliſion of intereſts between the public and private ſyſtem of affections, or the ends which each claſs has in view, will be afterwards conſidered; but where there is no colliſion, there is little or no danger of carrying either, but eſpecially the public affection, to exceſs, provided both kinds are kept ſubordinate to a diſcreet and cool ſelf-love, and to a calm and univerſal benevolence; which principles ſtand as guards at the head of each ſyſtem.

This then is the conduct of the paſſions, conſidered as particular and ſeparate forces, carrying us out to their reſpective ends; and this is their balance or œconomy, conſidered as compound powers, or powers mutually related, acting in conjunction towards a common end, and conſequently as forming a ſyſtem or whole.

Now, whatever adjuſts or maintains this balance, whatever in the human conſtitution is formed for directing the paſſions, ſo as to keep them from defeating their own end or interfering with each other, muſt be a principle of a ſuperior nature to them, and ought to direct their meaſures, and govern their proportions. But it was found, that reaſon or reflection is ſuch a principle, which points out the tendency of our paſſions, weighs their influence upon private and public happineſs, and ſhews the beſt means of attaining either. It having been likewiſe found, that there is another directing or controuling principle, which we call conſcience, or the moral ſenſe, which, by a native kind of authority, judges of affections and actions, pronouncing ſome juſt and good, and others unjuſt and ill; it follows, that the paſſions, which are mere impulſes, or blind forces, are principles inferior and ſubordinate to this judging faculty. Therefore, if we would obſerve the mutual reſpects and the ſubordination which the different parts of the human conſtitution bear one to another, the paſſions ought to be ſubjected to the direction and authority of the leading or controuling principles.

We conclude therefore from this induction, that "the conſtitution or juſt œconomy of human nature conſiſts in a regular ſubordination of the paſſions and affections to the authority of conſcience, and the direction of reaſon."

That ſubordination is regular, when the proportion formerly mentioned is maintained; that is to ſay, "When the defenſive paſſions are kept proportioned to our dangers; when the private paſſions are proportioned to our wants; and when the public affections are adapted to our public connections, and proportioned to the wants and dangers of others."

But the natural ſtate, or the ſound and vigorous conſtitution, of any creature, or the juſt œconomy of its powers, we call its health and perfection; and the acting agreeably to theſe, its virtue or goodneſs. Therefore, "the health and perfection of man muſt lie in the aforeſaid ſupremacy of conſcience and reaſon, and in the ſubordination of the paſſions to their authority and direction; and his virtue or goodneſs muſt conſiſt in acting agreeably to that order or œconomy."

That ſuch an œconomy of the mind, and ſuch a conduct of its power and paſſions, will ſtand the teſt of reaſon, cannot admit of any diſpute. For, upon a fair examination into the conſequences of things, or the relations and aptitudes of means to ends, reaſon evidently demonſtrates, and experience confirms it, that "to have our defenſive paſſions duly proportioned to our dangers, is the ſureſt way to avoid or get clear of them, and obtain the ſecurity we ſeek after."—"To proportion our private paſſions to our wants, is the beſt means to ſupply them;—and, to adapt our public affections to our ſocial relations and the good of others, is the moſt effectual method of fulfilling one, and procuring the other." In this ſenſe, therefore, virtue may be ſaid to be a "conduct conformable to reaſon, as reaſon diſcovers an apparent aptitude in ſuch an order and œconomy of powers and paſſions to anſwer the end for which they are naturally formed.

If the idea of moral obligation is to be deduced merely from this aptitude or connection between certain paſſions, or a certain order and balance of paſſions, and certain ends

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ends obtained or to be obtained by them; then is reaſon or reflection, which perceives that aptitude or connection, the proper judge of moral obligation; and on this ſuppoſition it may be defined, "the connection between the affection and the end, or between the action and the motive:" for the end is the motive, or the final cauſe; and the affection is the action, or its immediate natural cauſe. A man, from mere ſelf-love, may be induced to fulfil that obligation which is founded on the connection between the defenſive paſſions and their ends, or the private paſſions and their ends; becauſe, in that caſe, his own intereſt will prompt him to indulge them in the due proportion required. But if he has no affections which point beyond himſelf, no principle but ſelf-love or ſome ſubtle modification of it, what ſhall intereſt him in the happineſs of others, where there is no connection between it and his own? or what ſenſe can he have of moral obligation to promote it? Upon this ſcheme therefore, without publick or ſocial affections there could be no motive, and conſequently no moral obligation, to a beneficent diſintereſted conduct.

But if the mere connection between certain paſſions, or a certain order of paſſions, and certain ends, is what conſtitutes or gives us the idea of moral obligation; then why may not the appoſiteneſs of any temper or conduct, nay, of any piece of machinery, to obtain its end, form an equally ſtrict moral obligation? For the connection and aptitude are as ſtrong and invariable in the latter inſtances as in the former. But as this is confounding the moſt obvious differences of things, we muſt trace the idea of moral obligation to another and a more natural ſource.

Let us appeal therefore to ſenſe and experience, "how we ſtand affected to thoſe different ſets of paſſions in the juſt meaſure and balance of which we found a right temper to conſiſt." For this is entirely a matter of experience, in which we muſt examine, as in any other natural inquiry, "what are the genuine feelings and operations of nature, and what affections or ſymptoms of them appear in the given inſtance."

The defenſive paſſions, as anger and fear, give us rather pain than pleaſure; yet we cannot help feeling them when provoked by injury or expoſed to harm. We account the creature imperfect that wants them, becauſe they are neceſſary to his defence. Nay, we ſhould in ſome meaſure condemn ourſelves, did we want the neceſſary degree of reſentment and caution. But if our reſentment exceeds the wrong received, or our caution the evil dreaded, we then blame ourſelves for having overacted our part. Therefore, while we are in danger, to be totally deſtitute of them we reckon a blameable defect, and to feel them in a juſt, *i. e.* neceſſary meaſure, we approve, as ſuited to the nature and condition of ſuch a creature as man. But, our ſecurity obtained, to continue to indulge them, we not only diſapprove as hurtful, but condemn as unmanly, unbecoming, and mean-ſpirited: Nor will ſuch a conduct afford any ſelf-approving joy, when we coolly reflect upon it.

With regard to the private paſſions, ſuch as love of life, pleaſure, eaſe, and the like; as theſe aim at private good, and are neceſſary to the perfection and happineſs of the individual, we ſhould reckon any creature defective, and even blameable, that was deſtitute of them. Thus, we condemn the man who imprudently ruins his fortune, impairs his health, or expoſes his life; we not only pity him as an unfortune creature, but feel a kind of moral indignation and contempt of him, for having made himſelf ſuch. On the other hand, though a diſcreet ſelf regard does not attract our eſteem and veneration, yet we approve of it in ſome degree, in an higher and different degree from what we would regard a well-contrived machine as neceſſary to conſtitute a finiſhed creature, nay, to complete the virtuous character, and as exactly ſuited to our preſent indigent ſtate. There are ſome paſſions reſpecting private good, towards which we feel higher degrees of approbation; as the love of knowledge, of action, of honour, and the like. We eſteem them as marks of an ingenious mind, and cannot help thinking the character in which they are wanting remarkably ſtupid, and in ſome degree immoral.

With regard to the ſocial affections, as compaſſion, natural affection, friendſhip, benevolence, and the like, we approve, admire, and love them in ourſelves, and in all in whom we diſcover them, with an eſteem and approbation, if not different in kind, yet ſurely far ſuperior in degree to what we feel towards the other paſſions. Theſe we reckon neceſſary, juſt, and excellently fitted to our ſtructure and ſtate; and the creature which wants them we call defective, ill-conſtituted, a kind of abortion. But the public affections we eſteem as ſelf-worthy, originally and eternally amiable.

But among the ſocial affections, we make an obvious and conſtant diſtinction, *viz.* between thoſe particular paſſions, which urge us with a ſudden violence, and uneaſy kind of ſenſation, to purſue the good of their reſpective objects, as pity, natural affection, and the like; and thoſe calm diſpaſſionate affections and deſires which prompt us more ſteadily and uniformly to promote the happineſs of others. The former we generally call *paſſions*; to diſtinguiſh them from the other ſort, which go more commonly by the name of *affections*, or *calm deſires*. The firſt kind we approve indeed, and delight in; but we feel ſtill higher degrees of approbation and moral complacence towards the laſt, and towards all limitations of the particular inſtincts, by the principle of univerſal benevolence. The more objects the calm affections take in, and the worthier theſe are, their dignity riſes in proportion, and with this our approbation keeps an exact pace. A character, on the other hand, which is quite diveſted of theſe public affections, which feels no love for the ſpecies, but, inſtead of it, entertains malice, rancour, and ill-will, we reckon totally immoral and unnatural.

Such then are the ſentiments and diſpoſitions we feel, when theſe ſeveral orders of affection paſs before the mental eye.

Therefore, "that ſtate in which we feel ourſelves moved, in the manner above deſcribed, towards thoſe affections and paſſions, as they come under the mind's review, and in which we are inſtantaneouſly, and independently of our choice or volition, prompted to a correſpondent conduct, we call a ſtate of moral obligation." Let us ſuppoſe, for inſtance, a parent, a friend, a benefactor, reduced

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duced to a condition of the utmoſt indigence and diſtreſs, and that it is in our power to give them immediate relief. To what conduct are we obliged? what duty does nature dictate and require in ſuch a caſe? Attend, and nature will tell with a voice irreſiſtibly audible and commanding to the human heart, "that immediate relief ought to be given." Again, let a friend, a neighbour, or even a ſtranger, have lodged a depoſit in our hands, and after ſome time reclaim it; no ſooner do theſe ideas of the confidence repoſed in us, and of property not transferred but depoſited, occur, than we immediately and unavoidably feel and recognize the obligation to reſtore it. In both theſe caſes, we ſhould condemn ourſelves, if we acted otherwiſe, as having done, or omitted doing, what we ought not;—as having acted beneath the dignity of our nature—contrary to our moſt intimate ſenſe of right and wrong:—we ſhould accuſe ourſelves as guilty of ingratitude, injuſtice, and inhumanity;—and be conſcious of deſerving the cenſure, and therefore dread the reſentment, of all rational beings.—But in complying with the obligation, we feel joy and ſelf-approbation,—are conſcious of an inviolable harmony between our nature and duty,—and think ourſelves entitled to the applauſe of every impartial ſpectator of our conduct.

To deſcribe therefore what we cannot perhaps define, a ſtate of moral obligation, is "that ſtate in which a creature, endued with ſuch ſenſes, powers, and affections as man, would condemn himſelf, and think he deſerved the condemnation of all others, ſhould he refuſe to fulfil it; but would approve himſelf, and expect the approbation of all others, upon complying with it."

And we call him a moral agent, who is in ſuch a ſtate, or is ſubject to moral obligation. Therefore as man's ſtructure and connections often ſubject him to ſuch a ſtate of moral obligation, we conclude that he is a moral agent. But as man may ſometimes act without knowing what he does, as in caſes of frenzy or diſeaſe, or in many natural functions; or, knowing what he does, he may act without choice or affection, as in caſes of neceſſity or compulſion; therefore, to denominate an action moral, *i.e.* approveable, or blameable, it muſt be done knowingly and willingly, or from affection and choice. A morally good action, then, is "to fulfil a moral obligation knowingly and willingly;" and a morally bad action, or an immoral action, is "to violate a moral obligation knowingly and willingly."

As not an action, but a ſeries of actions conſtitute a character; as not an affection, but a ſeries of affections conſtitute a temper; and as we denominate things by the groſs, *à fortiori*, or by the qualities which chiefly prevail in them: "therefore we call that a morally good character, in which a ſeries of morally good actions prevail; and that a morally good temper, in which a ſeries of morally good affections have the aſcendant." A bad character and bad temper are the reverſe. But where the above mentioned order or proportion of paſſions is maintained, there a ſeries of morally good affections and actions will prevail. Therefore, "to maintain that order and proportion, is to have a morally good temper and character." But a "morally good temper and character is moral rectitude, integrity, virtue, or the completion of duty."

If it be aſked, after all, "How we come by the idea of moral obligation or duty?" we may anſwer, that we come by it in the ſame way as by our other original and primary perceptions. We receive them all from nature, or the great Author of nature. For this idea of moral obligation is not a creature of the mind, or dependent on any previous act of volition; but ariſes on certain occaſions, or when certain other ideas are preſented to the mind, as neceſſarily, inſtantaneouſly, and unavoidably, as pain does upon too near an approach to the fire, or pleaſure from the fruition of any good. It does not, for inſtance, depend on our choice, whether we ſhall feel the obligation to ſuccour a diſtreſſed parent, or to reſtore a depoſit intruſted to us when it is recalled. We cannot call this a compound idea made up of one or more ſimple ideas. We may indeed, nay, we muſt, have ſome ideas antecedent to it, *e. g.* that of a parent—in diſtreſs—of a child—able to relieve—of the relation of one to the other,—of a truſt,—of right, *&c.* But none of theſe ideas conſtitute the perception of obligation. Theſe indeed, by a law of our nature, are the occaſion of ſuggeſting it; but they are as totally different from it, as colours are from ſounds. By ſenſe or reflection we perceive the correlatives, our memory recalls the favours or depoſit we received, the various circumſtances of the caſe are matters of fact or experience; but ſome delicate inward organ or power, or call it what we pleaſe, does, by a certain inſtantaneous ſympathy, antecedent to the cool deductions of reaſon, and independent of previous inſtruction, art, or volition, perceive the moral harmony, the living irreſiſtible charm of moral obligation, which immediately intereſts the correſpondent paſſions, and prompts us to fulfil its awful dictates.

We need not apprehend any danger from the quickneſs of its deciſions; nor be frightened, becauſe it looks like inſtinct, and has been called ſo. Would we approve one for deliberating long, or reaſoning the matter much at leiſure, whether he ſhould relieve a diſtreſſed parent, feed a ſtarving neighbour, or reſtore the truſt committed to him? Should we not ſuſpect the reaſoner of knavery, or of very weak affections to virtue? We employ reaſon in examining the condition, relations, and other circumſtances of the agent or patient, or of thoſe with whom either of them are connected, or, in other words, the ſtate of the caſe; and in complicated caſes, where the circumſtances are many, it may require no ſmall attention to find the true ſtate of the caſe: but when the relations of the agent or patient, and the circumſtances of the actions, are obvious, or come out ſuch after a fair trial, we ſhould ſcarce approve him who demurs on the obligation to that conduct which the caſe ſuggeſts.

From what has been ſaid it is evident, that it is not the pleaſure or agreeable ſenſations which accompany the exerciſe of the ſeveral affections, nor thoſe conſequent to the actions, that conſtitute moral obligation, or excite in us the idea of it. That pleaſure is poſterior to the idea of obligation; and frequently we are obliged, and acknowledge ourſelves under an obligation, to ſuch affections

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affections and actions as are attended with pain; as in the trials of virtue, where we are obliged to ſacrifice private to public good, or a preſent pleaſure to a future intereſt. We have pleaſure in ſerving an aged parent, but it is neither the perception nor proſpect of that pleaſure which gives us the idea of obligation to that conduct.

The Final *Cauſes of our* Moral *Faculties of* Perception *and* Affection.

We have now taken a general proſpect of man, and of his moral powers and connections; and on theſe erected a ſcheme of duty, or moral obligation, which ſeems to be confirmed by experience, conſonant to reaſon, and approved by his moſt inward and moſt ſacred ſenſes. It may be proper, in the next place, to take a more particular view of the final cauſes of thoſe delicate ſprings by which he is impelled to action, and of thoſe clogs by which he is reſtrained from it.——By this detail we ſhall be able to judge of their aptitude to anſwer their end, in a creature endued with his capacities, ſubject to his wants, expoſed to his dangers, and ſuſceptible of his enjoyments; and from thence, we ſhall be in condition to pronounce concerning the end of his whole ſtructure, its harmony with his ſtate, and conſequently its ſubſerviency to anſwer the great and benevolent intentions of its author.

The ſupreme being has ſeen fit to blend in the whole of things a prodigious variety of diſcordant and contrary principles, light and darkneſs, pleaſure and pain, good and evil. There are multifarious natures, higher and lower, and many intermediate ones between the wide diſtant extremes. Theſe are differently ſituated, variouſly adjuſted, and ſubjected to each other; and all of them ſubordinate to the order and perfection of the whole. We may ſuppoſe man placed as in a centre amidſt thoſe innumerable orders of beings; by his outward frame drawn to the material ſyſtem, and by his inward connected with the intellectual or moral, and of courſe affected by the laws which govern both, or affected by that good and all that ill which reſult from thoſe laws. In this infinite variety of relations with which he is ſurrounded, and of contingencies to which he is liable, he feels ſtrong attractions to the good, and violent repulſions or averſions to the ill. But as good and ill are often blended, and wonderfully complicated one with the other; as they ſometimes immediately produce and run up into each other, and at other times lie at great diſtances, yet, by means of intervening links, introduce one another; and as theſe effects are often brought about in conſequence of hidden relations, and general laws, of the energy of which he is an incompetent judge; it is eaſy for him to miſtake good for evil, and evil for good; and conſequently he may be frequently attracted by ſuch things as are deſtructive, or repel ſuch as are ſalutary. Thus, by the tender and complicated frame of his body, he is ſubjected to a great variety of ills, to ſickneſs, cold, heat, fatigue, and innumerable wants. Yet his knowledge is ſo narrow withal, and his reaſon ſo weak, that in many caſes he cannot judge, in the way of inveſtigation, or reaſoning, of the connections of thoſe effects with their reſpective cauſes, or of the various latent energies of natural things. He is therefore informed of this connection by the experience of certain ſenſes, or organs of perception, which, by a mechanical inſtantaneous motion, feel the good and the ill, receiving pleaſure from one, and pain from the other. By theſe, without any reaſoning, he is taught to attract or chuſe what tends to his welfare, and to repel and avoid what tends to his ruin. Thus, by his ſenſes of taſte and ſmell, or by the pleaſure he receives from certain kinds of food, he is admoniſhed which agree with his conſtitution, and, by an oppoſite ſenſe of pain, he is informed which ſorts diſagree, or are deſtructive of it; but is not by means of theſe inſtructed in the inward natures and conſtitutions of things.

Some of thoſe ſenſes are armed with ſtrong degrees of uneaſineſs or pain, in order to urge him to ſeek after ſuch objects as are ſuited to them. And theſe reſpect his more immediate and preſſing wants; as the ſenſe of hunger, thirſt, cold, and the like; which by their painful importunities, compel him to provide food, drink, raiment, ſhelter. Thoſe inſtincts by which we are thus prompted, with ſome kind of commotion or violence, to attract and purſue good, or to repel and avoid ill, we call appetites and paſſions. By our ſenſes then we are informed of what is good or ill to the private ſyſtem, or the individual; and by our private appetites and paſſions we are impelled to one, and reſtrained from the other.

In conſequence of this machinery, and the great train of wants to which our nature ſubjects us, we are engaged in a continued ſeries of occupations, which often require much application of thought, or great bodily labour, or both. The neceſſaries of life, food, cloaths, ſhelter, and the like, muſt be provided; conveniencies muſt be acquired to render life ſtill more eaſy and comfortable. In order to obtain theſe, arts, induſtry, manufactures, and trade are neceſſary: and to ſecure to us the peaceable enjoyment of their fruits, civil government, policy, and laws muſt be contrived, and the various buſineſs of public life carried on. Thus while man is concerned and buſied in making proviſion, or obtaining ſecurity for himſelf, he is by degrees engaged in connections with a family, friends, neighbours, a community, or a commonwealth. Hence ariſe new wants, new intereſts, new cares, and new employments. The paſſions of one man interfere with thoſe of another. Intereſts are oppoſed. Competitions ariſe; contrary courſes are taken. Diſappointments happen, diſtinctions are made, and parties formed. This opens a vaſt ſcene of diſtraction and embarraſſment, and introduces a mighty train of good and ill, both public and private. Yet amidſt all this confuſion and hurry, plans of action muſt be laid, conſequences foreſeen or guarded againſt, inconveniencies provided for; and frequently particular reſolutions muſt be taken, and ſchemes executed, without reaſoning or delay.

Now, what proviſion has the Author of our nature made for this neceſſitous condition? How has he fitted the actor, man, for playing his part in this perplexed and buſy ſcene?

Our ſupreme Parent, watchful for the whole, has not left himſelf without a witneſs here neither, and hath made nothing imperfect, but all things are double one againſt another. He has not left man to be informed, only by the cool notices of reaſon, of the good or ill, the happineſs or miſery of his fellow creatures. He has

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made him ſenſible of their good and happineſs, but eſpecially of their ill and miſery, by an immediate ſympathy, or quick feeling of pleaſure and of pain.

The latter we call pity or compaſſion. For the former, though every one who is not quite diveſted of humanity feels it in ſome degree, we have not got a name, unleſs we call it congratulation, or joyful ſympathy, or that good humour which ariſes on ſeeing others pleaſed or happy. Both theſe feelings have been called, in general, the public or common ſenſe, by which we feel for others, and are intereſted in their concerns as really, though perhaps leſs ſenſibly, than in our own.

When we ſee our fellow-creatures unhappy through the fault or injury of others, we feel reſentment or indignation againſt the unjuſt cauſers of that miſery. If we are conſcious that it has happened through our fault or injurious conduct, we feel ſhame; and both theſe claſſes of ſenſes and paſſions, regarding miſery and wrong, are armed with ſuch ſharp ſenſations of pain, as not only prove a powerful guard and ſecurity to the ſpecies, or public ſyſtem, againſt thoſe ills it may, but ſerve alſo to leſſen or remove thoſe ills it does, ſuffer. Compaſſion draws us out of ourſelves to bear a part of the misfortunes of others, powerfully ſolicits us in their favour, melts us at ſight of their diſtreſs, and makes us in ſome degree unhappy till they are relieved from it. It is peculiarly well adapted to the condition of human life, becauſe it is much more and oftener in our power to do miſchief than good, and to prevent or leſſen miſery than to communicate poſitive happineſs; and therefore it is an admirable reſtraint upon the more ſelfiſh paſſions, or thoſe violent impulſes that carry us to the hurt of others.

There are other particular inſtincts or paſſions, which intereſt us in the concerns of others, even while we are moſt buſy about our own, and which are ſtrongly attractive of good, and repulſive of ill to them. Such are natural affection, friendſhip, love, gratitude, deſire of fame, love of ſociety, of one's country. Now as the private appetites and paſſions were found to be armed with ſtrong ſenſations of deſire and uneaſineſs, to prompt man the more effectually to ſuſtain labours, and encounter dangers, in purſuit of thoſe goods that are neceſſary to the preſervation and welfare of the individual, and to avoid thoſe ills which tend to his deſtruction; in like manner it was neceſſary that this other claſs of deſires and affections ſhould be prompted with as quick ſenſations of pain, not only to counteract the ſtrength of their antagoniſts, but to engage us in a virtuous activity for our relations, families, friends, neighbours, country. Indeed our ſenſe of right and wrong will admoniſh us that it is our duty, and reaſon and experience farther aſſure us that it is both our intereſt and beſt ſecurity, to promote the happineſs of others; but that ſenſe, that reaſon, and that experience, would frequently prove but weak and ineffectual prompters to ſuch a conduct, eſpecially in caſes of danger and hardſhip, and amidſt all the importunities of nature, and that conſtant hurry in which the private paſſions involve us, without the aid of thoſe particular kind affections, which mark out to us particular ſpheres of duty, and with an agreeable violence engage and fix us down to them.

It is evident therefore, that theſe two claſſes of affection, the private and public, are ſet one againſt the other, and deſigned to controul and limit each others influence, and thereby to produce a juſt balance in the whole. In general, the violent ſenſations of pain or uneaſineſs which accompany hunger, thirſt, and the other private appetites, or too great fatigue of mind as well as of body, prevent the individual from running to great exceſſes in the exerciſe of the higher functions of the mind; as too intenſe thought in the ſearch of truth, violent application to buſineſs of any kind, and different degrees of romantic heroiſm. On the other hand, the finer ſenſes of perception, and thoſe generous deſires and affections which are connected with them, the love of action, of imitation, of truth, honour, public virtue, and the like, are wiſely placed in the oppoſite ſcale, in order to prevent us from ſinking into the dregs of the animal life, and debaſing the dignity of man below the condition of brutes. So that by the mutual reaction of thoſe oppoſite powers, the bad effects are prevented that would naturally reſult from their acting ſingly and apart, and the good effects are produced which each are ſeverally formed to produce.

The ſame wholeſome oppoſition appears likewiſe in the particular counterworkings of the private and public affections one againſt the other. Thus compaſſion is adapted to counterpoiſe the love of eaſe, of pleaſure, and of life; and to diſarm, or to ſet bounds to reſentment: and reſentment of injury done to ourſelves or to our friends, prevents an effeminate compaſſion or conſternation; and gives us a noble contempt of labour, pain, and death. Natural affection, friendſhip, love of one's country, nay, zeal for any particular virtue, are frequently more than a match for the whole train of ſelfiſh paſſions. On the other hand, without that intimate over-ruling paſſion of ſelf-love, and thoſe private deſires which are connected with it, the ſocial and tender inſtincts of the human heart would degenerate into the wildeſt dotage, the moſt torturing anxiety, and downright frenzy.

But not only are the different orders or claſſes of affection checks one upon another, but paſſions of the ſame claſſes are mutual clogs. Thus, how many are withheld from the violent outrages of reſentment by fear? and how eaſily is fear controuled in its turn, while mighty wrongs awaken a mighty reſentment? The private paſſions often interefere, and therefore moderate the violence of each other; and a calm ſelf-love is placed at their head to direct, influence, and controul their particular attractions and repulſions. The public affections likewiſe reſtrain one the other; and all of them are put under the controul of a calm diſpaſſionate benevolence, which ought in like manner to direct and limit their particular motions.——Thus moſt part, if not all the paſſions have a twofold aſpect, and ſerve a twofold end. In one view they may be conſidered as powers, impelling mankind to a certain courſe, with a force proportioned to the apprehended moment of the good they aim at. In another view they appear as weights balancing the action of the powers, and controuling the violence of their impulſes. By means of theſe powers and weights a natural poiſe is ſettled in the human breaſt by its all-wiſe Author,

by

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by which the creature is kept tolerably ſteady and regular in his courſe, amidſt that variety of ſtages through which he muſt paſs.

But this is not all the proviſion which God has made for the hurry and perplexity of the ſcene in which man is deſtined to act. Amidſt thoſe infinite attractions and repulſions towards private and public good and ill, mankind either cannot often foreſee the conſequences or tendencies of all their actions towards one or other of theſe, eſpecially where thoſe tendencies are intricate and point different ways, or thoſe conſequences remote and complicated: or though, by careful and cool inquiry, and a due improvement of their rational powers, they might find them out; yet diſtracted as they are with buſineſs, amuſed with triſles, diſſipated by pleaſure, and diſturbed by paſſion, they either have, or can find, no leiſure to attend to thoſe conſequences, or to examine how far this or that conduct is productive of private or public good on the whole. Therefore, were it left entirely to the ſlow and ſober deductions of reaſon to trace thoſe tendencies and make out thoſe conſequences, it is evident, that, in many particular inſtances, the buſineſs of life muſt ſtand ſtill, and many important occaſions of action be loſt, or perhaps the groſſeſt blunders be commited. On this account the Deity, beſides that general approbation which we beſtow on every degree of kind affection, has moreover implanted in man many particular perceptions, or determinations, to approve of certain qualities or actions, which, in effect, tend to the advantage of ſociety, and are connected with private good, though he does not always ſee that tendency, nor mind that connection. And theſe perceptions or determinations do, without reaſoning, point out, and, antecedent to views of intereſt, prompt to a conduct beneficial to the public, and uſeful to the private ſyſtem. Such is that ſenſe of candor and veracity, that abhorrence of fraud and falſhoood, that ſenſe of fidelity, juſtice, gratitude, greatneſs of mind, fortitude, clemency, decorum; and that diſapprobation of knavery, injuſtice, ingratitude, meanneſs of ſpirit, cowardice, cruelty and indecorum, which are natural to the human mind. The former of thoſe diſpoſitions, and the actions flowing from them, are approved, and thoſe of the latter kind diſapproved by us, even abſtracted from the view of their tendency or conduciveneſs to the happineſs or miſery of others or of ourſelves. In one we diſcern a beauty, a ſuperior excellency, a congruity to the dignity of man; in the other a deformity, a littleneſs, a debaſement of human nature.

There are other principles alſo, connected with the good of ſociety, or the happineſs and perfection of the individual, though that connection is not immediately apparent, which we behold with real complacency and approbation, though perhaps inferior in degree, if not in kind; ſuch as gravity, modeſty, ſimplicity of deportment, temperance, prudent oeconomy; and we feel ſome degree of contempt and diſlike where they are wanting, or where the oppoſite qualities prevail. Theſe and the like perceptions or feelings are either different modifications of the moral ſenſe, or ſubordinate to it, and plainly ſerve the ſame important purpoſe, being expeditious monitors in the ſeveral emergencies of a various and diſtracted life, of what is right, what is wrong, what is to be purſued, and what avoided; and, by the pleaſant or painful conſciouſneſs which attends them, exerting their influence as powerful prompters to a ſuitable conduct.

From a ſlight inſpection of the above-named principles, it is evident they all carry a friendly aſpect to ſociety and the individual, and have a more immediate or a more remote tendency to promote the perfection or good of both. This tendency cannot be always foreſeen, and would be often miſtaken, or ſeldom attended to by a weak, buſy, ſhort-ſighted creature, like man, both raſh and variable in his opinions, a dupe to his own paſſions or to the deſigns of others, liable to ſickneſs, to want, and to error. Principles, therefore, which are ſo nearly linked with private ſecurity and public good, by directing him, without operoſe reaſoning, where to find one, and how to promote the other, and by prompting him to a conduct conducive to both, are admirably adapted to the exigencies of his preſent ſtate, and wiſely calculated to obtain the ends of univerſal benevolence.

It were eaſy, by conſidering the ſubject in another light, to ſhew, in a curious detail of particulars, how wonderfully the inſide of man, or that aſtoniſhing train of moral powers and affections with which he is endued, is fitted to the ſeveral ſtages of that progreſſive and probationary ſtate, through which he is deſtined to paſs. As our faculties are narrow and limited, and riſe from very ſmall and imperfect beginnings, they muſt be improved by exerciſe, by attention, and repeated trials. And this holds true, not only of our intellectual, but of our moral and active powers. The former are liable to errors in ſpeculation, the latter to blunders in practice, and both often terminate in misfortunes and pains: and thoſe errors and blunders are generally owing to our paſſions, or to our too forward and warm admiration of thoſe partial goods they naturally purſue, or to our fear of thoſe partial ills they naturally repel. Thoſe misfortunes therefore lead us back to conſider where our miſconduct lay, and whence our errors flowed; and conſequently are ſalutary pieces of trial, which tend to enlarge our views, to correct and refine our paſſions, and conſequently improve both our intellectual and moral powers.—Our paſſions then are the rude materials of our virtue, which heaven has given us to work up, to refine and poliſh into an harmonious and divine piece of workmanſhip. They furniſh out the whole machinery, the calms and ſtorms, the lights and ſhades of human life. They ſhew mankind in every attitude and variety of character, and give virtue both its ſtruggles and its triumphs. To conduct them well in every ſtate, is merit; to abuſe or miſapply them, is demerit.

The different ſets of ſenſes, powers, and paſſions, which unfold themſelves in thoſe ſucceſſive ſtages, are both neceſſary, and adapted to that riſing and progreſſive ſtate. Enlarging views and growing connections require new paſſions and new habits; and thus the mind, by theſe continually expanding and finding a progreſſive exerciſe, riſes to higher improvements, and puſhes forward to maturity and perfection.

In this beautiful oeconomy and harmony of our ſtructure, both outward and inward, with that ſtate, we may at

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at once diſcern the great lines of our duty traced out in the faireſt and brighteſt characters, and contemplate with admiration a more auguſt and marvellous ſcene of divine wiſdom and goodneſs laid in the human breaſt, than we ſhall perhaps find in the whole compaſs of nature.

From this detail it appears, that man, by his original frame, is made for a temperate, compaſſionate, benevolent, active, and progreſſive ſtate. He is ſtrongly attractive of the good, and repulſive of the ills, which befall others as well as himſelf. He feels the higheſt approbation and moral complacence in thoſe affections and in thoſe actions which immediately and directly reſpect the good of others, and the higheſt diſapprobation and abhorrence of the contrary. Beſides theſe, he has many particular perceptions or inſtincts of approbation, which though perhaps not of the ſame kind with the others, yet are accompanied with correſpondent degrees of affection, proportioned to their reſpective tendencies to the public good. Therefore, by acting agreeably to theſe principles, man acts agreeably to his ſtructure, and fulfils the benevolent intentions of its Author.

The principal Diſtinctions of Duty or Virtue.

We have now conſidered the conſtitution and connections of man; and on theſe erected a general ſyſtem of duty or moral obligation, conſonant to reaſon, approved by his moſt ſacred and intimate ſenſe, ſuitable to his mixed condition, and confirmed by the experience of mankind. We have alſo traced the final cauſes of his moral faculties and affections to thoſe noble purpoſes they anſwer with regard both to the private and the public ſyſtem.

From this induction it is evident, that there is one order or claſs of duties which man owes to himſelf; another to ſociety; and a third to God.

The duties he owes to himſelf are founded chiefly on the defenſive and private paſſions, which prompt him to purſue whatever tends to private good or happineſs, and to avoid or ward off whatever tends to private ill or miſery. Among the various goods which allure and ſolicit him, and the various ills which attack or threaten him, "To be intelligent and accurate in ſelecting one, and rejecting the other, or in preferring the moſt excellent goods, and avoiding the moſt terrible ills, when there is a competition among either, and to be diſcreet in uſing the beſt means to attain the goods and avoid the ills, is what we call prudence." This, in our inward frame, correſponds to ſagacity, or a quickneſs of ſenſe in our outward.—"To proportion our defenſive paſſions to our dangers, we call fortitude;" which always implies "a juſt mixture of calm reſentment or animoſity, and well governed caution." And this firmneſs of mind anſwers to the ſtrength and muſcling of the body.—And "duly to adjuſt our private paſſions to our wants, or to the reſpective moment of the good we affect or purſue, we call temperance;" which does therefore always imply "a juſt balance or command of the paſſions."

The ſecond claſs of duties ariſes from the public or ſocial affections; "the juſt harmony or proportion of which to the dangers and wants of others, and to the ſeveral relations we bear, commonly goes by the name of juſtice." This includes the whole of our duty to ſociety, to its parent, and the general polity of nature; particularly gratitude, friendſhip, ſincerity, natural affection, benevolence, and the other ſocial virtues. The virtues comprehended under the former claſs, eſpecially prudence and fortitude, may likewiſe be transferred to this; and according to the various circumſtances in which they are placed, and the more confined or more extenſive ſphere in which they operate, may be denominated private, oeconomical, or civil prudence, fortitude, *&c.* Theſe direct our conduct with regard to the wants and dangers of thoſe leſſer or greater circles with which we are connected.

The third claſs of duties reſpects the Deity, and ariſes alſo from the public affections, and the ſeveral glorious relations which he ſuſtains to us, as our creator, benefactor, law giver, judge, *&c.*

We choſe to conſider this ſet of duties in the laſt place, becauſe, though prior in dignity and excellency, they ſeem to be laſt in order of time, as thinking it the moſt ſimple and eaſy method to follow the gradual progreſs of nature, as it takes its riſe from individuals, and ſpreads through the ſocial ſyſtem, and ſtill aſcends upwards, till at length it ſtretches to its almighty Parent and Head, and ſo terminates in thoſe duties which are higheſt and beſt.

The duties reſulting from theſe relations, are reverence, gratitude, love, reſignation, dependence, obedience, worſhip, praiſe; which, according to the model of our finite capacities, muſt maintain ſome ſort of proportion to the grandeur and perfection of the object whom we venerate, love, and obey. "This proportion or harmony, is expreſſed by the general name of piety or devotion;" which is always ſtronger or weaker, according to the greater or leſs apprehended excellency of its object. This ſublime principle of virtue, is the enlivening ſoul which animates the moral ſyſtem, and that cement which binds and ſuſtains the other duties which man owes to himſelf or to ſociety.

This then is the general temper and conſtitution of virtue, and theſe are the principal lines or diviſions of duty. To thoſe good diſpoſitions, which reſpect the ſeveral objects of our duty, and to all actions which flow from ſuch diſpoſitions, the mind gives its ſanction or teſtimony. And this ſanction or judgment concerning the moral quality, or the goodneſs of actions or diſpoſitions, moraliſts call conſcience. When it judges of an action that is to be performed, it is called an antecedent conſcience; and when it paſſes ſentence on an action which is performed, it is called a ſubſequent conſcience. The tendency of an action to produce happineſs, or its external conformity to a law, is termed its material goodneſs; but the good diſpoſitions from which an action proceeds, or its conformity to law in every reſpect, conſtitutes its formal goodneſs.

When the mind is ignorant or uncertain about the moment of an action, or its tendency to private or public good; or when there are ſeveral circumſtances in the caſe, ſome of which being doubtful, render the mind dubious concerning the morality of the action; this is called a doubtful or ſcrupulous conſcience: if it miſtakes concern-

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ing theſe, it is called an erroneous conſcience. If the error or ignorance is involuntary or invincible, the action proceeding from that error, or from that ignorance, is reckoned innocent, or not imputable. If the error or ignorance is ſupine or affected, *i. e.* the effect of negligence, or of affectation and wilful inadvertence, the conduct flowing from ſuch error, or ſuch ignorance, is criminal and imputable. Not to follow one's conſcience, though erroneous and ill-formed, is criminal, as it is the guide of life; and to counteract it, ſhews a depraved and incorrigible ſpirit: Yet, to follow an erroneous conſcience is likewiſe criminal, if that error which miſled the conſcience was the effect of inattention, or of any criminal paſſion.

If it be aſked, "How an erroneous conſcience ſhall be rectified, ſince it is ſuppoſed to be the only guide of life, and judge of morals?" we anſwer, In the very ſame way that we would rectify reaſon, if at any time it ſhould judge wrong, as it often does, *viz.* By giving it proper and ſufficient materials for judging right, *i. e.* by inquiring into the whole ſtate of the caſe; the relations, connections, and ſeveral obligations of the actor; the conſequences, and other circumſtances of the action; or the ſurpluſage of private or public good which reſults, or is likely to reſult, from the action or from the omiſſion of it. If thoſe circumſtances are fairly and fully ſtated, the conſcience will be juſt and impartial in its deciſion. For, by a neceſſary law of our nature, it approves, and is well affected to the moral form; and if it ſeems to approve of vice or immorality, it is always under the notion or maſk of ſome virtue. So that, ſtrictly ſpeaking, it is not conſcience which errs; for its ſentence is always conformable to the view of the caſe which lies before it; and is juſt, upon the ſuppoſition that the caſe is truly ſuch as it is repreſented to it. All the fault is to be imputed to the agent, who neglects to be better informed, or who, thro' weakneſs or wickedneſs, haſtens to paſs ſentence from an imperfect evidence.

Of Man's Duty to HIMSELF. *Of the Nature of* GOOD, *and the* CHIEF GOOD.

EVERY creature, by the conſtitution of his nature, is determined to love himſelf, to purſue whatever tends to his preſervation and happineſs, and to avoid whatever tends to his hurt and miſery. Being endued with ſenſe and perception, he muſt neceſſarily receive pleaſure from ſome objects, and pain from others. Thoſe objects which give pleaſure are called good, and thoſe which give pain evil. To the former he feels that attraction or motion we call deſire, or love: To the latter that impulſe we call averſion or hatred. To objects which ſuggeſt neither pleaſure nor pain, and are apprehended of no uſe to procure one, or ward off the other, we feel neither deſire nor averſion; and ſuch objects are called indifferent. Thoſe objects which do not of themſelves produce pleaſure or pain, but are the means of procuring either, we call uſeful or noxious. Towards them we are affected in a ſubordinate manner, or with an indirect and reflective, rather than a direct and immediate affection. All the original and particular affections of our nature, lead us out to, and ultimately reſt in, the firſt kind of objects, *viz.* thoſe which give immediate pleaſure, and which we therefore call good, directly ſo. The calm affection of ſelf-love alone is converſant about ſuch objects as are only conſequentially good, or merely uſeful to ourſelves.

But beſides thoſe ſorts of objects which we call good, merely and ſolely as they give pleaſure, or are means of procuring it, there is an higher and nobler ſpecies of good, towards which we feel that peculiar movement we call approbation or moral complacency, and which we therefore denominate moral good. Such are our affections, and the conſequent actions to them. The perception of this is quite diſtinct in kind from the perception of the other ſpecies; and though it may be connected with pleaſure or advantage by the benevolent conſtitution of nature, yet it conſtitutes a good independent of that pleaſure and that advantage, and far ſuperior, not in degree only, but in dignity, to both. The other, *viz.* the natural good, conſiſts in obtaining thoſe pleaſures which are adapted to the peculiar ſenſes and paſſions ſuſceptible of them, and is as various as are thoſe ſenſes and paſſions. This, *viz.* the moral good, lies in the right conduct of the ſeveral ſenſes and paſſions, or their juſt proportion and accommodation to their reſpective objects and relations; and this is of a more ſimple and invariable kind.

By our ſeveral ſenſes we are capable of a great variety of pleaſing ſenſations. Theſe conſtitute diſtinct ends or objects ultimately purſuable for their own ſake. To theſe ends, or ultimate objects, correſpond peculiar appetites or affections, which prompt the mind to purſue them. When theſe ends are attained, there it reſts and looks no farther. Whatever therefore is purſuable, not on its own account, but as ſubſervient or neceſſary to the attainment of ſomething elſe that is intrinſically valuable or for its own ſake, we call a mean, and not an end. So that ends, and not means, conſtitute the materials or the very eſſence of our happineſs. Conſequently, happineſs cannot be one ſimple uniform thing in creatures conſtituted, as we are, with ſuch various ſenſes of pleaſure, or ſuch different capacities of enjoyment. Now, the ſame principle or law of our nature which determines us to purſue any one end or ſpecies of good, prompts us to purſue every other end or ſpecies of good of which we are ſuſceptible, or to which our Maker has adapted an original propenſion. But amidſt the great multiplicity of ends or goods, which form the various ingredients of our happineſs, we perceive an evident gradation or ſubordination, ſuited to that gradation of ſenſes, powers, and paſſions, which prevails in our mixed and various conſtitution, and to that aſcending ſeries of connections which open upon us in the different ſtages of our progreſſive ſtate.

Thus the goods of the body, or of the external ſenſes, ſeem to hold the loweſt rank in this gradation or ſcale of goods. Theſe we have in common with the brutes: and though many men are brutiſh enough to purſue the goods of the body with a more than brutual fury; yet when at any time they come in competition with goods of an higher order, the unanimous verdict of mankind, by giving the laſt the preference, condemns the firſt to the meaneſt

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meaneſt place. Goods conſiſting in exterior ſocial connections, as fame, fortune, power, civil authority, ſeem to ſucceed next, and are chiefly valuable as the means of procuring natural or moral good, but principally the latter. Goods of the intellect are ſtill ſuperior; as taſte, knowledge, memory, judgment, *&c.* The higheſt are moral goods of the mind, directly and ultimately regarding ourſelves; as command of the appetites and paſſions, prudence, fortitude, benevolence, *&c.* Theſe are the great objects of our purſuit, and the principal ingredients of our happineſs. Let us conſider each of them, as they riſe one above the other in this natural ſeries or ſcale, and touch briefly on our obligations to purſue them.

Thoſe of the body are health, ſtrength, agility, hardineſs, and patience of change, neatneſs, and decency.

Good health, and a regular eaſy flow of ſpirits, are in themſelves ſweet natural enjoyments, a great fund of pleaſure, and indeed the proper ſeaſoning which gives a flavour and poignancy to every other pleaſure. The want of health unfits us for moſt duties of life, and is eſpecially an enemy to the ſocial and human affections, as it generally renders the unhappy ſufferer peeviſh and ſullen, diſguſted at the allotments of providence, and conſequently apt to entertain ſuſpicious and gloomy ſentiments of its Author. It obſtructs the free exerciſe and full improvement of our reaſon, makes us a burden to our friends, and uſeleſs to ſociety. Whereas the uninterrupted enjoyment of good health, is a conſtant ſource of good humour: and good humour is a great friend to openneſs and benignity of heart; enables us to encounter the various ills and diſappointments of life with more courage, or to ſuſtain them with more patience; and, in ſhort, conduces much, if we are otherwiſe duly qualified, to our acting our part in every exigency of life with more firmneſs, conſiſtency, and dignity. Therefore it imports us much to preſerve and improve an habit or enjoyment, without which every other external entertainment is taſteleſs, and moſt other advantages of little avail. And this is beſt done by a ſtrict temperance in diet and regimen, by regular exerciſe, and by keeping the mind ſerene and unruffled by violent paſſions, and unſubdued by intenſe and conſtant labours, which greatly impair, and gradually deſtroy, the ſtrongeſt conſtitutions.

Strength, agility, hardineſs, and patience of change, ſuppoſe health, and are unattainable without it; but they imply ſomething more, and are neceſſary to guard it, to give us the perfect uſe of life and limbs, and to ſecure us againſt many otherwiſe unavoidable ills. The exerciſe of the neceſſary manual, and of moſt the elegant arts of life, depends on ſtrength and agility of body; perſonal dangers, private and public dangers, the demands of our friends, our families and country require them; they are neceſſary in war, and ornamental in peace; fit for the employments of a country and a town life, and they exalt the entertainments and diverſions of both. They are chiefly obtained by moderate and regular exerciſe.

Few are ſo much raiſed above want and dependence, or ſo exempted from buſineſs and care, as not to be often expoſed to inequalities and changes of diet, exerciſe, air, climate, and other irregularities. Now, what can be ſo effectual to ſecure one againſt the miſchiefs ariſing from ſuch unavoidable alterations, as hardineſs, and a certain verſatility of conſtitution, which can bear extraordinary labours, and ſubmit to great changes, without any ſenſible uneaſineſs or bad conſequences. This is beſt attained, not by an over great delicacy and minute attentions to forms, or by an invariable regularity in diet, hours, and way of living, but rather by a bold diſcreet latitude of regimen. Beſides, deviations from eſtabliſhed rules and forms of living, if kept within the bounds of ſobriety and reaſon, are friendly to thought and original ſentiment, animate the dull ſcene of ordinary life and buſineſs, and agreeably ſtir the paſſions, which ſtagnate or breed ill humour in the calms of life.

Neatneſs, cleanlineſs, and decency, to which we may add dignity of countenance and demeanour, ſeem to have ſomething refined and moral in them. At leaſt we generally eſteem them indications of an orderly, genteel, and well-governed mind, conſcious of inward worth, or the reſpect due to one's nature. Whereas naſtineſs, ſlovenlineſs, aukwardneſs, and indecency, are ſhrewd ſymptoms of ſomething mean, careleſs, and deficient, and betray a mind untaught, illiberal, unconſcious of what is due to one's ſelf or to others. How much cleanlineſs conduces to health needs hardly to be mentioned; and how neceſſary it is to maintain one's character and rank in life, and to render us agreeable to others as well as to ourſelves, is as evident.—There are certain motions, airs and geſtures, which become the human countenance and form, in which we perceive a comelineſs, openneſs, ſimplicity, gracefulneſs; and there are others, which, to our ſenſe of decorum, appear uncomely, affected, diſingenuous, and aukward, quite unſuitable to the native dignity of our face and form. The firſt are in themſelves the moſt eaſy, natural, and commodious; give one boldneſs and preſence of mind, a modeſt aſſurance, an adreſs both awful and alluring, they beſpeak candour and greatneſs of mind, raiſe the moſt agreeable prejudices in one's favour, render ſociety engaging, command reſpect, and often love, and give weight and authority both in converſation and buſineſs: in fine, they are the colouring of virtue, which ſhew it to the greateſt advantage in whomſoever it is; and not only imitate, but in ſome meaſure ſupply it where it is wanting. Whereas the laſt, *viz.* rudeneſs, affectation, indecorum, and the like, have all the contrary effects; they are burdenſome to one's ſelf, a diſhonour to our nature, and a nuiſance in ſociety. The former qualities or goods are beſt attained by a liberal education, by preſerving a juſt ſenſe of the dignity of our nature, by keeping the beſt and politeſt company; but above all, by acquiring thoſe virtuous and ennobling habits of mind, which are decency in perfection, which will give an air of unaffected grandeur, and ſpread a luſtre truly engaging over the whole form and deportment.

We are next to conſider thoſe goods which conſiſt in exterior ſocial connections; as fame, fortune, civil authority, power.

The firſt has a twofold aſpect; as a good pleaſant in itſelf, or gratifying to an original paſſion; and then, as expedient or uſeful towards a farther end. Honour from the wiſe and good, on the account of a virtuous conduct, is regaling to a good man. There are few quite indifferent even

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even to the commendation of the vulgar. Though we cannot approve that conduct which proceeds entirely from this principle, and not from good affection or love of the conduct itself; yet as it is often a guard and additional motive to virtue in creatures imperfect as we are, and often diſtracted by interfering paſſions, it might be dangerous to ſuppreſs it altogether, however wiſe it may be to reſtrain it within due bounds, and however laudable to uſe it only as a ſcaffolding to our virtue, which may be taken down when that glorious ſtructure is finiſhed, but hardly till then. To purſue fame for itſelf, is innocent; to regard it only as an auxiliary to virtue, is noble; to ſeek it chiefly as an engine of public uſefulneſs, is ſtill more noble. For though the opinion and breath of men are tranſient and fading things; often obtained without merit, and loſt without cauſe: yet as our buſineſs is with men, and as our capacity of ſerving them is generally increaſed in proportion to their eſteem of us; therefore ſound and well-eſtabliſhed moral applauſe may, and will be, modeſtly, not oſtentatiouſly, ſought after by the good; not indeed as a ſolitary refined ſort of luxury, but as a public and proper inſtrument to ſerve and bleſs mankind. At the ſame time they will learn to deſpiſe that reputation which is founded on rank, fortune, and any other circumſtances or accompliſhments that are foreign to real merit, or to uſeful ſervices done to others; and think that praiſe of little avail which is purchaſed without deſert, and beſtowed without judgment.

Fortune, power, and civil authority, or whatever is called influence and weight among mankind, are goods of the ſecond diviſion; that is, valuable and purſuable only as they are uſeful, or as means to a farther end, *viz.* the procuring or preſerving the immediate objects of enjoyment or happineſs to ourſelves or others. Therefore, to love ſuch goods on their own account, and to purſue them as ends, not the means of enjoyment, muſt be highly prepoſterous and abſurd. There can be no meaſure, no limit to ſuch purſuit; all muſt be whim, caprice, extravagance. Accordingly, ſuch appetites, unlike all the natural ones, are increaſed by poſſeſſion, and whetted by enjoyment. They are always precarious, and never without fears becauſe the objects lie without one's ſelf; they are ſeldom without ſorrow and vexation, becauſe no acceſſion of wealth or power can ſatisfy them. But if thoſe goods are conſidered only as the materials or means of private or public happineſs; then the ſame obligations which bind us to purſue the latter, bind us likewiſe to purſue the former. We may, and no doubt we ought, to ſeek ſuch a meaſure of wealth as is neceſſary to ſupply all our real wants, to raiſe us above ſervile dependence, and provide us with ſuch conveniencies as are ſuited to our rank and condition in life. To be regardleſs of this meaſure of wealth, is to expoſe ourſelves to all the temptations of poverty and corruption; to forfeit our natural independency and freedom; to degrade, and conſequently to render the rank we hold, and the character we ſuſtain in ſociety, uſeleſs, if not contemptible. When theſe important ends are ſecured, we ought not to murmur or repine that we poſſeſs no more; yet we are not ſecluded by any obligation, moral or divine, from ſeeking more, in order to give us that happieſt and moſt God-like of all powers, the power of doing good. A ſupine indolence in this reſpect is both abſurd and criminal; abſurd, as it robs us of an inexhauſted fund of the moſt refined and durable enjoyments; and criminal, as it renders us ſo far uſeleſs to the ſociety to which we belong. "That purſuit of wealth which goes beyond the former end; *viz.* the obtaining the neceſſaries, or ſuch conveniences of life, as in the eſtimation of reaſon, not of vanity or paſſion, are ſuited to our rank and condition, and yet is not directed to the latter, *viz.* the doing good, is what we call avarice." And "that purſuit of power, which, after ſecuring one's ſelf, *i. e.* attaining the proper independence and liberty of a rational ſocial creature, is not directed to the good of others, is what we call ambition, or the luſt of power." To what extent the ſtrict meaſures of virtue will allow us to purſue either wealth, or power, and civil authority, is not perhaps poſſible preciſely to determine. That muſt be left to prudence, and the peculiar character, condition, and other circumſtances of each man. Only thus far a limit may be ſet, that the purſuit of either muſt encroach upon no other duty or obligation which we owe to ourſelves, to ſociety, or to its Parent and Head. The ſame reaſoning is to be applied to power as to wealth. It is only valuable as an inſtrument of our own ſecurity, and of the free enjoyment of thoſe original goods it may, and often does, adminiſter to us; and as an engine of more extenſive happineſs to our friends, our country, and mankind.

Now the beſt, and indeed the only way to obtain a ſolid and laſting fame, is an uniform inflexible courſe of virtue, the employing one's ability and wealth in ſupplying the wants, and uſing one's power in promoting or ſecuring the happineſs, the rights and liberties of mankind, joined to an univerſal affability and politeneſs of manners. And ſurely one will not miſtake the matter much, who thinks the ſame courſe conducive to the acquiring greater acceſſions both of wealth and power: eſpecially if he adds to thoſe qualifications a vigorous induſtry, a conſtant attention to the characters and wants of men, to the conjunctures of times, and continually varying genius of affairs; and a ſteddy intrepid honeſty, that will neither yield to the allurements, nor be overawed with the terrors of that corrupt and corrupting ſcene in which we live. We have ſometimes heard, indeed, of other ways and means, as fraud, diſſimulation, ſervility, and proſtitution, and the like ignoble arts, by which the men of the world (as they are called, ſhrewd politicians, and men of addreſs!) amaſs wealth, and procure power: but as we want rather to form a man of virtue, an honeſt, contented, happy man, we leave to the men of the world their own ways, and permit them unenvied, and unimitated by us, to reap the fruit of their doings.

The next ſpecies of objects in the ſcale of good, are the goods of the intellect; as knowledge, memory, judgement, taſte, ſagacity, docility, and whatever elſe we call intellectual virtues. Let us conſider them a little, and the means as well as obligations to improve them.

As man is a rational creature, capable of knowing the differences of things and actions;—as he not only ſees and feels what is preſent, but remembers what is paſt, and often foreſees what is future;—as he advances, from ſmall beginnings

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beginnings, by ſlow degrees, and with much labour and difficulty, to knowledge and experience ;—as his opinions ſway his paſſions;—as his paſſions influence his conduct,—and as his conduct draws conſequences after it, which extend not only to the preſent, but to the future time, and therefore is the principal ſource of his happineſs or miſery;—it is evident, that he is formed for intellectual improvements, and that it muſt be of the utmoſt conſequence for him to improve and cultivate his intellectual powers, on which thoſe opinions, thoſe paſſions, and that conduct depend.

But beſides the future conſequences and moment of improving our intellectual powers, their immediate exerciſe on their proper objects yields the moſt rational and refined pleaſures. Knowledge and a right taſte in the arts of imitation and deſign, as poetry, painting, ſculpture, muſic, architecture, afford not only an innocent, but a moſt ſenſible and ſublime entertainment. By theſe the underſtanding is inſtructed in ancient and modern life, the hiſtory of men and things, the energies and effects of the paſſions, the conſequences of virtue and vice; by theſe the imagination is at once entertained and nouriſhed with the beauties of nature and art, lighted up and ſpread out with the novelty, grandeur, and harmony of the univerſe; and in fine, the paſſions are agreeably rouzed, and ſuitably engaged by the greateſt and moſt intereſting objects that can fill the human mind. He who has a taſte formed to theſe ingenious delights, and plenty of materials to gratify it, can never want the moſt agreeable exerciſe and entertainment, nor once have reaſon to make that faſhionable complaint of the tediouſneſs of time. Nor can he want a proper ſubject for the diſcipline and improvement of his heart. For being daily converſant with beauty, order and deſign, in inferior ſubjects, he bids fair for growing in due time an admirer of what is fair and well-proportioned in the conduct of life, and the order of ſociety, which is only order and deſign exerted in their higheſt ſubject. He will learn to transfer the numbers of poetry to the harmony of the mind, and of well-governed paſſions; and from admiring the vritues of others in moral paintings, come to approve and imitate them himſelf. Therefore to cultivate a true and correct taſte, muſt be both our intereſt and our duty, when the circumſtances of our ſtation give leiſure and opportunity for it, and when the doing it is not inconſiſtent with our higher obligations or engagements to ſociety and mankind.

It is beſt attained by reading the beſt books, where good ſenſe has more the aſcendant than learning, and which retain more to practice than to ſpeculation; by ſtudying the beſt models, *i. e.* thoſe which profeſs to imitate nature moſt, and approach the neareſt to it; and by converſing with men of the moſt refined taſte, and the greateſt experience in life.

As to the other intellectual goods, what a fund of entertainment muſt it be to inveſtigate the truth and various relations of things; to trace the operations of nature to general laws; to explain by theſe its manifold phænomena: to underſtand that order by which the univerſe is upheld, and that œconomy by which it is governed; to be acquainted with the human mind, the connection, ſubordinations, and uſes of its powers, and to mark their energy in life! How agreeable to the ingenious inquirer, to obſerve the manifold relations and combinations of individual minds in ſociety; to diſcern the cauſes why they flouriſh or decay; and from thence to aſcend, through the vaſt ſcale of beings, to that General Mind which preſides over all, and operates unſeen in every ſyſtem, and in every age, through the whole compaſs and progreſſion of nature! Devoted to ſuch entertainments as theſe, the contemplative have abandoned every other pleaſure, and ſequeſtered themſelves from ſocial intercourſe; for theſe the buſy have often preferred, to the hurry and din of life, the calm retreats of contemplation; for theſe, when once they came to taſte them, even the gay and voluptuous have thrown up the lawleſs purſuits of ſenſe and appetite, and acknowledged theſe mental enjoyments to be the moſt refined, and indeed the only luxury. Beſides, by a juſt and large knowledge of nature, we recognize the perfections of its Author; and thus piety, and all thoſe pious affections which depend on juſt ſentiments of his character, are awakened and confirmed; and a thouſand ſuperſtitious fears, that ariſe from partial views of his nature and works, will of courſe be excluded. An extenſive proſpect of human life, and of the periods and revolutions of human things, will conduce much to the giving a certain greatneſs of mind, and a noble cotempt of thoſe little competitions about power, honour, and wealth, which diſturb and divide the bulk of mankind; and promote a calm indurance of thoſe inconveniencies and ills that are the common appendages of humanity. Add to all, that a juſt knowledge of human nature, and of thoſe hinges upon which the buſineſs and fortunes of men turn, will prevent our thinking either too highly, or too meanly of our fellow-creatures; give no ſmall ſcope to the exerciſe of friendſhip, confidence, and good-will; and, at the ſame time, brace the mind with a proper caution and diſtruſt, and give a greater maſtery in the conduct of private as well as public life. Therefore, by cultivating our intellectual abilities, we ſhall beſt promote and ſecure our intereſt, and be qualified for acting our part in ſociety with more honour to ourſelves, as well as advantage to mankind. Conſequently, to improve them to the utmoſt of our power is our duty; they are talents committed to us by the Almighty Head of ſociety, and we are accountable to him for the uſe of them.

The intellectual virtues are beſt improved by accurate and impartial obſervation, extenſive reading, and unconfined converſe with men of all characters, eſpecially with thoſe who, to private ſtudy, have joined the wideſt acquaintance with the world and greateſt practice in its affairs; but above all, by being much in the world, and having large dealings with mankind. Such opportunities contribute much to diveſt one of prejudices and a ſervile attachment to crude ſyſtems, to open one's views, and to give that experience on which the moſt uſeful knowledge is built, and from which the ſureſt maxims for the conduct of life are deduced.

The higheſt goods which enter into the compoſition of human happineſs are moral goods of the mind, directly and ultimately regarding ourſelves; as command of the appetites and paſſions, prudence and caution, magnanimity, fortitude,

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fortitude, humility, love of virtue, love of God, reſignation, and the like. Theſe ſublime goods are, by way of eminence, goods recommended and enforced by the moſt intimate and awful ſenſe and conſciouſneſs of our nature; goods that conſtitute the quinteſſence of happineſs, that form and complection of ſoul which renders us approveable and lovely in the ſight of God; goods, in fine, which are the elements of all our future perfection and felicity.

Moſt of the other goods we have conſidered depend partly on ourſelves, and partly on accidents which we can neither foreſee nor prevent, and reſult from cauſes which we cannot influence or alter. They are ſuch goods as we may poſſeſs to-day and loſe to-morrow, and which require a felicity of conſtitution and talents to attain them in full vigour and perfection, and a felicity of conjunctures to ſecure the poſſeſſion of them. Therefore, did our happineſs depend altogether or chiefly on ſuch tranſitory and precarious poſſeſſions, it were itſelf moſt precarious, and the higheſt folly to be anxious about it.—But though creatures, conſtituted as we are, cannot be indifferent about ſuch goods, and muſt ſuffer in ſome degree, and conſequently have our happineſs incomplete without them, yet they weigh but little in the ſcale when compared with moral goods. By the benevolent conſtitution of our nature, theſe are placed within the ſphere of our activity, ſo that no man can be deſtitute of them unleſs he is firſt wanting to himſelf. Some of the wiſeſt and beſt of mankind have wanted moſt of the former goods, and all the external kind, and felt moſt of the oppoſite ills; yet, by poſſeſſing the latter, have declared they were happy, and to the conviction of the moſt impartial obſervers have appeared happy. The worſt of men have been ſurrounded with every outward good and advantage of fortune, and have poſſeſſed great parts; yet, for want of moral rectitude, have been notoriouſly and exquiſitely miſerable. The exerciſe of virtue has ſupported its votaries, and made them exult in the midſt of tortures almoſt intolerable; nay, how often has ſome falſe form or ſhadow of it ſuſtained even the greateſt villains and bigots under the ſame preſſures! But no external goods, no goods of fortune, have been able to alleviate the agonies, or expel the fears of a guilty mind, conſcious of the deſerved hatred and reproach of mankind, and the juſt diſpleaſure of almighty God.

As the preſent condition of human life is wonderfully chequered with good and ill; and as no height of ſtation, no affluence of fortune, can abſolutely inſure the good or ſecure againſt the ill; it is evident, that a great part of the comfort and ſerenity of life muſt lie in having our minds duly affected with regard to both, *i. e.* rightly attempered to the loſs of one and the ſufferance of the other. For it is certain, that outward calamities derive their chief malignity and preſſure from the inward diſpoſitions with which we receive them. By managing theſe right, we may greatly abate that malignity and preſſure, and conſequently diminiſh the number and weaken the moment of the ills of life, if we ſhould not have it in our power to obtain a large ſhare of its goods. There are particularly three virtues which go to the forming this right temper towards ill, and which are of ſingular efficacy, if not totally to remove, yet wonderfully to alleviate the calamities of life. Theſe are fortitude, or patience, humility, and reſignation.

Fortitude is that calm and ſteddy habit of mind, which either moderates our fears, and enables us bravely to encounter the proſpect of ill, or renders the mind ſerene and invincible under its immediate preſſure. It lies equally diſtant from raſhneſs and cowardice; and though it does not hinder us from feeling, yet prevents our complaining or ſhrinking under the ſtroke. It always includes a generous contempt of, or at leaſt a noble ſuperiority to, thoſe precarious goods of which we can inſure neither the poſſeſſion nor continuance. The man therefore who poſſeſſes this virtue in this ample ſenſe of it, ſtands upon an eminence, and ſees human things below him; the tempeſt indeed may reach him, but he ſtands ſecure and collected againſt it upon the baſis of conſcious virtue, which the ſevereſt ſtorms can ſeldom ſhake, and never overthrow.

Humility is another virtue of high rank and dignity, though often miſtaken by proud mortals for meanneſs and puſillanimity. It is oppoſed to pride, which commonly includes in it a falſe or over-rated eſtimation of our own merit, an aſcription of it to ourſelves as its only and original cauſe, an undue compariſon of ourſelves with others, and, in conſequence of that ſuppoſed ſuperiority, an arrogant preference of ourſelves, and a ſupercilious contempt of them. Humility, on the other hand, ſeems to denote that modeſt and ingenuous temper of mind, which ariſes from a juſt and equal eſtimate of our own advantages compared with thoſe of others, and from a ſenſe of our deriving all originally from the Author of our being. Its ordinary attendants are mildneſs, a gentle forbearance, and an eaſy unaſſuming humanity with regard to the imperfections and faults of others; virtues rare indeed, but of the faireſt complection, the proper offspring of ſo lovely a parent, the beſt ornaments of ſuch imperfect creatures as we are, precious in the ſight of God, and which ſweetly allure the hearts of men.

Reſignation is that mild and heroic temper of mind, which ariſes from a ſenſe of an infinitely wiſe and good providence, and enables one to acquieſce with a cordial affection in its juſt appointments. This virtue has ſomething very peculiar in its nature, and ſublime in its efficacy. For it teaches us to bear ill, not only with patience, and as being unavoidable; but it transforms, as it were, ill into good, by leading us to conſider it, and every thing that has the leaſt appearance of ill, as a divine diſpenſation, a wiſe and benevolent temperament of things, ſubſervient to univerſal good, and of courſe including that of every individual, eſpecially of ſuch as calmly ſtoop to it. In this light, the adminiſtration itſelf, nay, every act of it, becomes an object of affection; the evil diſappears, or is converted into a balm which both heals and nouriſhes the mind. For, though the firſt unexpected acceſs of ill may ſurpriſe the ſoul into grief; yet that grief, when the mind calmly reviews its object, changes into contentment, and is by degrees exalted into veneration and a divine compoſure. Our private will is loſt in that of the Almighty, and our ſecurity againſt every real ill reſts on the ſame bottom as the throne of Him who lives and reigns for ever.

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Before we finiſh this ſection, it may be fit to obſerve, that as the Deity is the ſupreme and inexhauſted ſource of good, on whom the happineſs of the whole creation depends; as he is the higheſt object in nature, and the only object who is fully proportioned to the intellectual and moral powers of the mind, in whom they ultimately reſt and find their moſt perfect exerciſe and completion; he is therefore termed the *chief good* of man *objectively* conſidered: And virtue, or the proportioned and vigorous exerciſe of the ſeveral powers and affections on their reſpective objects, as above deſcribed, is, in the ſchools, termed the *chief good formally* conſidered, or its *formal* idea, being the inward temper and native conſtitution of human happineſs.

From the detail we have gone through, the following corollaries may be deduced.

1. It is evident that the happineſs of ſuch a progregreſſive creature as man can never be at a ſtand, or continue a fixed invariable thing. His finite nature, let it riſe ever ſo high, admits ſtill higher degrees of improvement and perfection: and his progreſſion in improvement, or virtue, always makes way for a progreſſion in happineſs. So that no poſſible point can be aſſigned in any period of his exiſtence in which he is perfectly happy, that is, ſo happy as to exclude higher degrees of happineſs. All his perfection is only comparative. 2. It appears that many things muſt conſpire to complete the happineſs of ſo various a creature as man, ſubject to ſo many wants, and ſuſceptible of ſuch different pleaſures. 3. As his capacities of pleaſure cannot be all gratified at the ſame time, and muſt often interfere with each other in ſuch a precarious and fleeting ſtate as human life, or be frequently diſappointed, perfect happineſs, *i. e.* the undiſturbed enjoyment of the ſeveral pleaſures of which we are capable, is unattainable in our preſent ſtate. 4. That ſtate is moſt to be ſought after, in which the feweſt competitions and diſappointments can happen, which leaſt of all impairs any ſenſe of pleaſure, and opens an inexhauſted ſource of the moſt refined and laſting enjoyments. 5. That ſtate which is attended with all thoſe advantages is a ſtate or courſe of virtue. 6. Therefore, a ſtate of virtue, in which the moral goods of the mind are attained, is the happieſt ſtate.

DUTIES *to* SOCIETY.

Filial and Fraternal duty.

As we have followed the order of nature in tracing the hiſtory of man, and thoſe duties which he owes to himſelf; it ſeems reaſonable to take the ſame method with thoſe he owes to ſociety, which conſtitute the ſecond claſs of his obligations.

His parents are among the earlieſt objects of his attention; he becomes ſooneſt acquainted with them, repoſes a peculiar confidence in them, and ſeems to regard them with a fond affection, the early prognoſtics of his future piety and gratitude. Thus does nature dictate the firſt lines of filial duty, even before a juſt ſenſe of the connection is formed. But when the child is grown up, and has attained to ſuch a degree of underſtanding as to comprehend the moral tie, and be ſenſible of the obligations he is under to his parents; when he looks back on their tender and diſintereſted affection, their inceſſant cares and labours in nurſing, educating and providing for him during that ſtate in which he had neither prudence nor ſtrength to care and provide for himſelf; he muſt be conſcious that he owes to them theſe peculiar duties.

1. To reverence and honour them as the inſtruments of nature in introducing him to life, and to that ſtate of comfort and happineſs which he enjoys; and therefore to eſteem and imitate their good qualities, to alleviate and bear with, and ſpread as much as poſſible a decent veil over their faults and weakneſſes.

2. To be highly grateful to them for thoſe favours which it can hardly ever be in his power fully to repay; to ſhew this gratitude by a ſtrict attention to their wants, and a ſolicitous care to ſupply them; by a ſubmiſſive deference to their authority and advice; by yielding to, rather than peeviſhly contending with their humours, as remembering how oft they have been perſecuted by his; and in fine, by ſoothing their cares, lightening their ſorrows, ſupporting the infirmities of age, and making the remainder of their life as comfortable and joyful as poſſible.

As his brethren and ſiſters are the next with whom the creature forms a ſocial and moral connection, to them he owes a fraternal regard; and with them ought he to enter into a ſtrict league of friendſhip, mutual ſympathy, adviee, aſſiſtance, and a generous intercourſe of kind offices, remembering their relation to common parents, and that brotherhood of nature which unites them into a cloſer community of intereſt and affection.

Concerning Marriage.

WHEN man arrives to a certain age, he becomes ſenſible of a peculiar ſympathy and tenderneſs towards the other ſex; the charms of beauty engage his attention, and call forth new and ſofter diſpoſitions than he has yet felt. The many amiable qualities exhibited by a fair outſide, or by the mild allurement of female manners, or which the prejudiced ſpectator without much reaſoning ſuppoſes thoſe to include, with ſeveral other circumſtances, point his view and affection to a particular object, and of courſe contract that general rambling regard, which was loſt and uſeleſs among the undiſtinguiſhed croud, into a peculiar and permanent attachment to one woman, which ordinarily terminates in the moſt important, venerable, and delightful connection in life.

The ſtate of the brute-creation is very different from that of human creatures. The former are cloathed and generally armed by their ſtructure, eaſily find what is neceſſary to their ſubſiſtence, and ſoon attain their vigour and maturity; ſo that they need the care and aid of their parents but for a ſhort while; and therefore we ſee that nature has aſſigned to them vagrant and tranſient amours. The connection being purely natural, and formed merely for propagating and rearing their offſpring; no ſooner is that end anſwered, than the connection diſſolves of courſe. But the human race are of a more tender and defenceleſs conſtitution; their infancy and non-age continue longer; they advance ſlowly to ſtrength of body, and maturity of reaſon; they need conſtant attention, and a long ſeries of

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cares and labours to train them up to decency, virtue, and the various arts of life. Nature has, therefore, provided them with the moſt affectionate and anxious tutors, to aid their weakneſs, to ſupply their wants, and to accompliſh them in thoſe neceſſary arts;—even their own parents, on whom ſhe has devolved this mighty charge, rendered agreeable by the moſt alluring and powerful of all ties, parental affection. But unleſs both concur in this grateful taſk, and continue their joint labours, till they have reared up and planted out their young colony, it muſt become a prey to every rude invader, and the purpoſe of nature in the original union of the human pair be defeated. Therefore our ſtructure as well as condition is an evident indication, that the human ſexes are deſtined for a more intimate, for a moral and laſting union. It appears likewiſe, that the principal end of marriage is not to propagate and nurſe up an offſpring, but to educate and form minds for the great duties and extenſive deſtinations of life. Society muſt be ſupplied from this original nurſery with uſeful members, and its faireſt ornaments and ſupports.

The mind is apt to be diſſipated in its views, and acts of friendſhip and humanity; unleſs the former be directed to a particular object, and the latter employed in a particular province. When men once indulge to this diſſipation, there is no ſtopping their career; they grow inſenſible to moral attractions, and, by obſtructing or impairing the decent and regular exerciſe of the tender and generous feelings of the human heart, they in time become unqualified for, or averſe to, the forming a moral union of ſouls, which is the cement of ſociety, and the ſource of the pureſt domeſtic joys. Whereas a rational undepraved love, and its fair companion marriage, collect a man's views, guide his heart to its proper object, and by confining his affection to that object do really enlarge its influence and uſe. Beſides, it is but too evident from the conduct of mankind, that the common ties of humanity are too feeble to engage and intereſt the paſſions of the generality in the affairs of ſociety. The connections of neighbourhood, acquaintance, and general intercourſe, are too wide a field of action for many; and thoſe of a public or community are ſo for more, and in which they either care not or know not how to exert themſelves. Therefore nature, ever wiſe and benevolent, by implanting that ſtrong ſympathy which reigns between the individuals of each ſex, and by urging them to form a particular moral connection, the ſpring of many domeſtic endearments, has meaſured out to each pair a particular ſphere of action, proportioned to their views, and adapted to their reſpective capacities. Beſides, by intereſting them deeply in the concerns of their own little circle, ſhe has connected them more cloſely with ſociety, which is compoſed of particular families, and bound them down to their good behaviour in that particular community to which they belong. This moral connection is marriage, and this ſphere of action is a family.

Of the conjugal alliance the following are the natural laws. 1. Mutual fidelity to the marriage-bed. Diſloyalty defeats the very end of marriage; diſſolves the natural cement of the relation; weakens the moral tie, the chief ſtrength of which lies in the reciprocation of affection; and, by making the offſpring uncertain, diminiſhes the care and attachment neceſſary to their education.

2. A conſpiration of counſels and endeavours to promote the common intereſt of the family, and to educate their common offſpring. In order to obſerve theſe laws, it is neceſſary to cultivate, both before and during the married ſtate, the ſtricteſt decency and chaſtity of manners, and a juſt ſenſe of what becomes their reſpective characters.

3. The union muſt be inviolable and for life. The nature of friendſhip, and particularly of this ſpecies of it, the education of their offſpring, and the order of ſociety, and of ſucceſſions which would otherwiſe be extremely perplexed, do all ſeem to require it. To preſerve this union, and render the matrimonial ſtate more harmonious and comfortable, a mutual eſteem and tenderneſs, a mutual deference and forbearance, a communication of advice, and aſſiſtance and authority, are abſolutely neceſſary. If either party keep within their proper departments, there need be no diſputes about power or ſuperiority, and there will be none. They have no oppoſite, no ſeparate intereſts; and therefore there can be no juſt ground for oppoſition of conduct.

From this detail, and the preſent ſtate of things, in which there is pretty near a parity of numbers of both ſexes, it is evident, that polygamy is an unnatural ſtate: and though it ſhould be granted to be more fruitful of children, which however it is not found to be; yet it is by no means ſo fit for rearing minds; which ſeems to be as much, if not more, the intention of nature, than the propagation of bodies.

Of Parental Duty.

The connection of parents with their children is a natural conſequence of the matrimonial connection, and the duties which they owe them reſult as naturally from that connection. The feeble ſtate of children, ſubject to ſo many wants and dangers, requires their inceſſant care and attention; their ignorant and uncultivated minds demand their continual inſtruction and culture. Had human creatures come into the world with the full ſtrength of men, and the weakneſs of reaſon and vehemence of paſſions which prevail in children, they would have been too ſtrong or too ſtubborn to have ſubmitted to the government and inſtruction of their parents. But, as they were deſigned for a progreſſion in knowledge and virtue, it was proper that the growth of their bodies ſhould keep pace with that of their minds, leſt the purpoſes of that progreſſion ſhould have been defeated. Among other admirable purpoſes which this gradual expanſion of their outward as well as inward ſtructure ſerves, this is one, that it affords ample ſcope to the exerciſe of many tender and generous affections, which fill up the domeſtic life with a beautiful variety of duties and enjoyments; and are of courſe a noble diſcipline for the heart, and an hardy kind of education for the more honourable and important duties of public life.

The above-mentioned weak and ignorant ſtate of children, ſeems plainly to inveſt their parents with ſuch authority

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thority and power as is neceſſary to their ſupport, protection, and education: but that authority and power can be conſtrued to extend no farther than is neceſſary to anſwer thoſe ends, and to laſt no longer than that weakneſs and ignorance continue; wherefore, the foundation or reaſon of the authority and power ceaſing, they ceaſe of courſe. Whatever power or authority, then, it may be neceſſary or lawful for parents to exerciſe during the non-age of their children, to aſſume or uſurp the ſame when they have attained the maturity or full exerciſe of their ſtrength and reaſon, would be tyrannical and unjuſt. From hence it is evident, that parents have no right to puniſh the perſons of their children more ſeverely than the nature of their wardſhip requires; much leſs to invade their lives, to encroach upon their liberty, or transfer them as their property to any maſter whatſoever.

The firſt claſs of duties which parents owe their children reſpect their natural life; and theſe comprehend protection, nurture, proviſion, introducing them into the world in a manner ſuitable to their rank and fortune, and the like.

The ſecond order of duties regards the intellectual and moral life of their children, or their education in ſuch arts and accompliſhments as are neceſſary to qualify them for performing the duties they owe to themſelves and to others. As this was found to be the principal deſign of the matrimonial alliance, ſo the fulfilling that deſign is the moſt important and dignified of all the parental duties. In order therefore to fit the child for acting his part wiſely and worthily, as a man, as a citizen, and a creature of God, both parents ought to combine their joint wiſdom, authority, and power, and each apart to employ thoſe talents which are the peculiar excellency and ornament of their reſpective ſex. The father ought to lay out and ſuperintend their education; the mother to execute and manage the detail of which ſhe is capable. The former ſhould direct the manly exertion of the intellectual and moral powers of his child. His imagination, and the manner of thoſe exertions, are the peculiar province of the latter. The former ſhould adviſe, protect, command, and by his experience, maſculine vigour, and that ſuperior authority which is commonly aſcribed to his ſex, brace and ſtrengthen his pupil for active life, for gravity, integrity, and firmneſs in ſuffering. The buſineſs of the latter is to bend and ſoften her male pupil, by the charms of her converſation, and the ſoftneſs and decency of her manners, for ſocial life, for politeneſs of taſte, and the elegant decorums of and enjoyments of humanity; and to improve and refine the tenderneſs and modeſty of her female pupil, and form her to all thoſe mild domeſtic virtues, which are the peculiar characteriſtics and ornaments of her ſex.

To conduct the opening minds of their ſweet charge through the ſeveral periods of their progreſs; to aſſiſt them in each period in throwing out the latent ſeeds of reaſon and ingenuity, and in gaining freſh acceſſions of light and virtue; and at length, with all theſe advantages, to produce the young adventurers upon the great theatre of human life, to play their ſeveral parts in the ſight of their friends, of ſociety, and mankind.

Herile and Servile Duty.

In the natural courſe of human affairs it muſt neceſſarily happen, that ſome of mankind will live in plenty and opulence, and others be reduced to a ſtate of indigence and poverty. The former need the labours of the latter, and the latter the proviſion and ſupport of the former. This mutual neceſſity is the foundation of that connection, whether we call it moral or civil, which ſubſiſts between maſters and ſervants. He who feeds another has a right to ſome equivalent, the labour of him whom he maintains, and the fruits of it. And he who labours for another has a right to expect that he ſhould ſupport him. But as the labours of a man of ordinary ſtrength are certainly of greater value than mere food and cloathing; becauſe they would actually produce more, even the maintenance of a family, were the labourer to employ them in his own behalf; therefore he has an undoubted right to rate and diſpoſe of his ſervice for certain wages above mere maintenance; and if he has incautiouſly diſpoſed of it for the latter only, yet the contract being of the onerous kind, he may equitably claim a ſupply of that deficiency. If the ſervice be ſpecified, the ſervant is bound to that only; if not, then he is to be conſtrued as bound only to ſuch ſervices as are conſiſtent with the laws of juſtice and humanity. By the voluntary ſervitude to which he ſubjects himſelf, he forfeits no rights but ſuch as are neceſſarily included in that ſervitude, and is obnoxious to no puniſhment but ſuch as a voluntary failure in the ſervice may be ſuppoſed reaſonably to require. The offſpring of ſuch ſervants have a right to that liberty which neither they nor their parents have forfeited.

As to thoſe who, becauſe of ſome heinous offence, or for ſome notorious damage, for which they cannot otherwiſe compenſate, are condemned to perpetual ſervice; they do not, on that account, forfeit all the rights of men; but thoſe, the loſs of which is neceſſary to ſecure ſociety againſt the like offences for the future, or to repair the damage they have done.

With regard to captives taken in war, it is barbarous and inhuman to make perpetual ſlaves of them, unleſs ſome peculiar and aggravated circumſtances of guilt have attended their hoſtility. The bulk of the ſubjects of any government engaged in war, may be fairly eſteemed innocent enemies; and therefore they have a right to that clemency which is conſiſtent with the common ſafety of mankind, and the particular ſecurity of that ſociety againſt which they are engaged. Though ordinary captives have a grant of their lives; yet to pay their liberty as an equivalent, is much too high a price. There are other ways of acknowledging or returning the favour, than by ſurrendering what is far dearer than life itſelf. To thoſe who, under pretext of the neceſſities of commerce, drive the unnatural trade of bargaining for human fleſh, and conſigning their innocent but unfortunate fellow-creatures to eternal ſervitude and miſery, we may addreſs the words of a fine writer; "Let avarice defend it as it will, there is an honeſt reluctance in humanity againſt buying and ſelling and regarding thoſe of our own ſpecies as our wealth and poſſeſſions."

Social

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Social Duties of the private Kind.

HITHERTO we have considered only the domestic oeconomical duties, because these are first in the progress of nature. But as man passes beyond the little circle of a family, he forms connections with relations, friends, neighbours, and others; from whence results a new train of duties of the more private social kind, as friendship, chastity, courtesy, good-neighbourhood, charity, forgiveness, hospitality.

Man is admirably formed for particular social attachments and duties. There is a peculiar and strong propensity in his nature to be affected with the sentiments and dispositions of others. Men, like certain musical instruments, are set to each other, so that the vibrations or notes excited in one raise correspondent notes and vibrations in the others. The impulses of pleasure or pain, joy or sorrow, made on one mind, are, by an instantaneous sympathy of nature, communicated in some degree to all; especially when hearts are in unison of kindness; the joy that vibrates in one, communicates to the other also. We may add, that though joy thus imparted swells the harmony; yet grief vibrated to the heart of a friend, and rebounding from thence in sympathetic notes, melts, as it were, and almost dies away. All the passions, but especially those of the social kind, are contagious; and when the passions of one man mingle with those of another, they increase and multiply prodigiously. There is a most moving eloquence in the human countenance, air, voice, and gesture, wonderfully expressive of the most latent feelings and passions of the soul, which darts them, like a subtle flame, into the hearts of others, and raises correspondent feelings there: friendship, love, good-humour, joy, spread through every feature, and particularly shoot from the eyes their softer and fiercer fires with an irresistible energy. And in like manner, the opposite passions of hatred, enmity, ill humour, melancholy, diffuse a sullen and saddening air over the face, and, flashing from eye to eye, kindle a train of similar passions. By these and other admirable pieces of machinery, men are formed for society and the delightful interchange of friendly sentiment and duties; to increase the happiness of others by participation, and their own by rebound; and to diminish, by dividing, the common stock of their misery.

The first emanations of the social principle beyond the bounds of a family, lead us to form a nearer conjunction of friendship or goodwill with those who are anywise connected with us by blood or domestic alliance. To them our affection does, commonly, exert itself in a greater or less degree, according to the nearness or distance of the relation. And this proportion is admirably suited to the extent of our powers and the indigence of our state; for it is only within those lesser circles of consanguinity or alliance, that the generality of mankind are able to display their abilities or benevolence, and consequently to uphold their connection with society and subserviency to a public interest. Therefore it is our duty to regard these closer connections as the next department to that of a family, in which nature has marked out for us a sphere of activity and usefulness; and to cultivate the kind affections which are the cement of those endearing alliances.

Frequently, the view of distinguishing moral qualities in some of our acquaintance may give birth to that more noble connection we call friendship, which is far superior to the alliances of consanguinity. For these are of a superficial, and often of a transitory nature; of which, as they hold more of instinct than of reason, we cannot give such a rational account. But friendship derives all its strength and beauty, and the only existence which is durable, from the qualities of the heart, or from virtuous and lovely dispositions. Therefore friendship may be described to be, "The union of two souls, by means of virtue, the common object and cement of their mutual affection." Without virtue, or the supposition of it, friendship is only a mercenary league, an alliance of interest, which must dissolve of course when that interest decays or subsists no longer. It is not so much any particular passion, as a composition of some of the noblest feelings and passions of the mind. Good sense, a just taste and love of virtue, a thorough candor and benignity of heart, or what we usually call a good temper, and a generous sympathy of sentiments and affections, are the necessary ingredients of this virtuous connection. When it is grafted on esteem, strengthened by habit, and mellowed by time, it yields infinite pleasure ever new and ever growing, is a noble support amidst the various trials and vicissitudes of life, and an high seasoning to most of our other enjoyments. To form and cultivate virtuous friendship must be very improving to the temper; as its principal object is virtue, set off with all the allurement of countenance, air, and manners, shining forth in the native graces of manly honest sentiments and affections, and rendered visible as it were to the friendly spectator in a conduct unaffectedly great and good; and as its principal exercises are the very energies of virtue, or its effects and emanations. So that, where-ever this amiable attachment prevails, it will exalt our admiration and attachment to virtue, and, unless impeded in its course by unnatural prejudices, run out into a friendship to the human race. For as no one can merit, and none ought to usurp, the sacred name of friend, who hates mankind; so, whoever truly loves them, possesses the most essential quality of a true friend.

The duties of friendship are, a mutual esteem of each other, unbribed by interest, and independent of it; a generous confidence, as far distant from suspicion as from reserve; an inviolable harmony of sentiments and dispositions, of designs and interests; a fidelity unshaken by the changes of fortune; a constancy unalterable by distance of time or place; a resignation of one's personal interests to those of one's friend; and a reciprocal, unenvious, unreserved exchange of kind offices.—But amidst all the exertions of this moral connection, humane and generous as it is, we must remember that it operates within a narrow sphere, and its immediate operations respect only the individual; and therefore particular impulses must still be subordinate to a more public interest, or be always directed and controuled by the more extensive connections of our nature.

When our friendship terminates on any of the other sex,

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ſex, in whom beauty or agreeableneſs of perſon and external gracefulneſs of manners conſpire to expreſs and heighten the moral charm of a tender honeſt heart; and ſweet, ingenuous, modeſt temper, lighted up by good ſenſe, it generally grows into a more ſoft and endearing attachment. When this attachment is improved by a growing acquaintance with the worth of its object, is conducted by diſcretion, and iſſues at length, as it ought to do, in the moral connection of marriage, it becomes the ſource of many amiable duties, of a communication of paſſions and intereſts, of the moſt refined decencies, and of a thouſand nameleſs deep-felt joys of reciprocal tenderneſs and love, flowing from every look, word, and action. Here friendſhip acts with double energy, and the natural conſpires with the moral charm to ſtrengthen and ſecure the love of virtue. As the delicate nature of female honour and decorum, and the inexpreſſible grace of a chaſte and modeſt behaviour, are the ſureſt and indeed the only means of kindling at firſt, and ever after of keeping alive this tender and elegant flame, and of accompliſhing the excellent ends deſigned by it; to attempt by fraud to violate one, or, under pretence of paſſion, ſully and corrupt the other, and, by ſo doing, to expoſe the too often credulous and unguarded object, with a wanton cruelty, to the hatred of her own ſex, and the ſcorn of ours, and to the loweſt infamy of both, is a conduct not only baſe and criminal, but inconſiſtent with that truly rational and refined enjoyment, the ſpirit and quinteſſence of which is derived from the baſhful and ſacred charms of virtue kept untainted, and therefore ever alluring to the lover's heart.

Courteſy, good-neighbourhoood, affability, and the like duties which are founded on our private ſocial connections, are no leſs neceſſary and obligatory to creatures united in ſociety, and ſupporting and ſupported by each other in a chain of mutual want and dependence. They do not conſiſt in a ſmooth addreſs, an artificial or obſequious air, fawning adulation, or a polite ſervility of manners; but in a juſt and modeſt ſenſe of our own dignity and that of others, and of the reverence due to mankind, eſpecially to thoſe who hold the higher links of the ſocial chain; in a diſcreet and manly accommodation of ourſelves to the the foibles and humours of others; in a ſtrict obſervance of the rules of decorum and civility; but above all in a frank obliging carriage, and generous interchange of good deeds rather than words. Such a conduct is of great uſe and advantage, as it is an excellent ſecurity againſt injury, and the beſt claim and recommendation to the eſteem, civility, and univerſal reſpect of mankind. This inferior order of virtues unites the particular members of ſociety more cloſely, and form the leſſer pillars of the civil fabric; which, in many inſtances, ſupply the unavoidable defects of laws, and maintain the harmony and decorum of ſocial intercourſe, where the more important and eſſential lines of virtue are wanting.

Charity and forgiveneſs are truly amiable and uſeful duties of the ſocial kind. There is a twofold diſtinction of rights commonly taken notice of by moral writers, *viz.* perfect and imperfect. To fulfil the former, is neceſſary to the being and ſupport of ſociety; to fulfil the latter, is a duty equally ſacred and obligatory, and tends to the improvement and proſperity of ſociety: but as the violation of them is not equally prejudicial to the public good, the fulfilling them is not ſubjected to the cognizance of laws, but left to the candor, humanity, and gratitude of individuals. And by this means ample ſcope is given to exerciſe all the generoſity, and diſplay the genuine merit and luſtre of virtue. Thus the wants and misfortunes of others call for our charitable aſſiſtance and ſeaſonable ſupplies: and the good man, unconſtrained by law, and uncontrouled by human authority, will chearfully acknowledge and generouſly ſatisfy this mournful and moving claim; a claim ſupported by the ſanction of heaven, of whoſe bounties he is honoured to be the grateful truſtee. If his own perfect rights are invaded by the injuſtice of others, he will not therefore reject their imperfect right to pity and forgiveneſs, unleſs his grant of theſe ſhould be inconſiſtent with the more extenſive rights of ſociety or the public good. In that caſe he will have recourſe to public juſtice and the laws; and even then he will proſecute the injury with no unneceſſary ſeverity, but rather with mildneſs and humanity. When the injury is merely perſonal, and of ſuch a nature as to admit of alleviations, and the forgiveneſs of which would be attended with no worſe conſequences, eſpecially of a public kind, the good man will generouſly forgive his offending brother. And it is his duty to do ſo, and not to take private revenge, or retaliate evil for evil. For though reſentment of injury is a natural paſſion, and implanted, as was obſerved above, for wiſe and good ends; yet, conſidering the manifold partialities which moſt men have for themſelves, was every one to act as judge in his own cauſe, and to execute the ſentence dictated by his own reſentment, it is but too evident that mankind would paſs all bounds in their fury, and the laſt ſufferer be provoked in his turn to make full repriſals. So that evil, thus encountering with evil, would produce one continued ſeries of violence and miſery, and render ſociety intolerable, if not impracticable. Therefore, where the ſecurity of the individual, or good of the public, does not require a proportionable retaliation, it is agreeeble to the general law of benevolence, and to the particular end of the paſſion (which is to prevent injury, and the miſery occaſioned by it) to forgive perſonal injuries, or not to return evil for evil. This duty is one of the noble refinements which Chriſtianity has made upon the general maxims and practice of mankind, and enforced with a peculiar ſtrength and beauty by ſanctions no leſs alluring than awful. And indeed the practice of it is generally its own reward; by expelling from the mind the moſt dreadful intruders upon its repoſe, thoſe rancorous paſſions which are begot and nurſed by reſentment; and by diſarming and even ſubduing every enemy one has, except ſuch as have nothing left of men but the outward form.

The moſt enlarged and humane connection of the private kind, ſeems to be the hoſpitable alliance from which flow the amiable and diſintereſted duties we owe to ſtrangers. If the exerciſe of paſſions of the moſt private and inſtinctive kind is beheld with moral approbation and delight, how lovely and venerable muſt thoſe appear, which reſult from a calm philanthropy, are founded in the common rights and connections of ſociety, and embrace men,

not

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not of a particular ſect, party, or nation, but all in general without diſtinction, and without any of the little partialities of ſelf-love!

Social Duties of the COMMERCIAL *Kind.*

THE next order of connections are thoſe which ariſe from the wants and weakneſs of mankind, and from the various circumſtances in which their different ſituations place them. Theſe we may call *commercial connections*; and the duties which reſult from them *commercial duties*, as juſtice, fair-dealing, ſincerity, fidelity to compacts, and the like.

Though nature is perfect in all her works, yet ſhe has obſerved a manifeſt and eminent diſtinction among them. To all ſuch as lie beyond the reach of human ſkill and power, and are properly of her own department, ſhe has given the finiſhing hand. Theſe man may deſign after and imitate; but he can neither rival them, nor add to their beauty or perfection: ſuch are the forms and ſtructure of vegetables, animals, and many of their productions. There are others of her works which ſhe has of deſign left unfiniſhed, as it were, in order to exerciſe the ingenuity and power of man. She has preſented to him a rich profuſion of materials of every kind for his conveniency and uſe; but they are rude and unpoliſhed, or not to be come at without art and labour. Theſe therefore he muſt apply, in order to adapt them to his uſe, and to enjoy them in perfection. Thus nature has given him an infinite variety of herbs, grain, foſſils, minerals, wood, water, earth, and a thouſand other crude materials to ſupply his numerous wants. But he muſt ſow, plant, dig, refine, poliſh, build, and, in ſhort, manufacture the various produce of nature, in order to obtain even the neceſſaries, and much more the conveniencies and elegancies of life. Theſe, then, are the price of his labour and induſtry; and, without that, nature will ſell him nothing. But as the wants of mankind are many, and the ſingle ſtrength of individuals ſmall, they could hardly find the neceſſaries, and much leſs the conveniencies of life, without uniting their ingenuity and ſtrength in acquiring theſe, and without a mutual intercourſe of good offices. Some men are better formed for ſome kinds of ingenuity and labour, and others for other kinds; and different ſoils and climates are enriched with different productions; ſo that men, by exchanging the produce of their reſpective labours, and ſupplying the wants of one country with the ſuperfluities of another, do, in effect, diminiſh the labours of each, and increaſe the abundance of all. This is the foundation of all commerce, or exchange of commodities and goods one with another; in order to facilitate which, men have contrived different ſpecies of coin or money, as a common ſtandard by which to eſtimate the comparative values of their reſpective goods. But, to render commerce ſure and effectual, juſtice, fair-dealing, ſincerity, and fidelity to compacts are abſolutely neceſſary.

Juſtice, or fair dealing, or, in other words, a diſpoſition to treat others as we would be treated by them, is a virtue of the firſt importance, and inſeparable from the virtuous character. It is the cement of ſociety, or that pervading ſpirit which connects its members, inſpires its various relations, and maintains the order and ſubordination of each part to the whole. Without it, ſociety would become a den of thieves and banditti, hating and hated, devouring and devoured, by one another.

Sincerity or veracity in our words and actions is another virtue or duty of great importance to ſociety, being one of the great bands of mutual intercourſe, and the foundation of mutual truſt. Without it, ſociety would be the dominion of miſtruſt, jealouſy and fraud, and converſation a traffick of lies and diſſimulation. It includes in it a conformity of our words with our ſentiments, a correſpondence between our actions and diſpoſitions, a ſtrict regard to truth, and an irreconcileable abhorrence of falſehood. It does not indeed require that we expoſe our ſentiments indiſcreetly, or tell all the truth in every caſe; but certainly it does not and cannot admit the leaſt violation of truth, or contradiction to our ſentiments. For if theſe bounds are once paſſed, no poſſible limit can be aſſigned where the violation ſhall ſtop; and no pretence of private or public good can poſſibly counterbalance the ill conſequences of ſuch a violation.

Fidelity to promiſes, compacts and engagments, is likewiſe a duty of ſuch importance to the ſecurity of commerce and interchange of benevolence among mankind, that ſociety would ſoon grow intolerable without the ſtrict obſervance of it. Hobbes, and others who follow the ſame track, have taken a worderful deal of pains to puzzle this ſubject, and to make all the virtues of this ſort merely artificial, and not at all obligatory, antecedent to human conventions. No doubt, compacts ſuppoſe people who make them, and promiſes ſuppoſe perſons to whom they are made; and therefore both ſuppoſe ſome ſociety more or leſs between thoſe who enter into theſe mutual engagements. But is not a compact or promiſe binding, till men have agreed that they ſhall be binding? Or are they only binding becauſe it is our intereſt to be bound by them, or to fulfill them? Do not we highly approve the man who fufills them, even though they ſhould prove to be againſt his intereſt? And do not we condemn him as a knave, who violates them on that account? A promiſe is a voluntary declaration, by words, or by an action equally ſignificant, of our reſolution to do ſomething in behalf of another, or for his ſervice. When a promiſe is made, the perſon who makes it is by all ſuppoſed under an obligation to perform it; and he to whom it is made may demand the performance as his right. That perception of obligation is a ſimple idea, and is on the ſame footing as our other moral perceptions, which may be deſcribed by inſtances, but cannot be defined. Whether we have a perception of ſuch obligation quite diſtinct from the intereſt, either public or private, that may accompany the fulfilment of it, muſt be referred to the conſcience of every individual. And, whether the mere ſenſe of that obligation, apart from its concomitants, is not a ſufficient inducement or motive to keep one's promiſe, without having recourſe to any ſelfiſh principal of our nature, muſt be likewiſe appealed to the conſcience of every honeſt man. Fair dealing and fidelity to compacts require that we take no advantage of the ignorance, paſſion, or incapacity of others, from whatever cauſe that incapacity ariſes;—that we be explicit and candid in making bargains, juſt and faithful

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faithful in fulfilling our part of them. And if the other party violates his engagements, redreſs is to be ſought from the laws, or from thoſe who are intruſted with the execution of them. In fine, the commercial virtues and duties require that we not only do not invade, but maintain the rights of others;—that we be fair and impartial in transferring, bartering, or exchanging property, whether in goods or ſervice;—and be inviolably faithful to our word and our engagements, where the matter of them is not criminal, and where they are not extorted by force.

Social Duties of the POLITICAL *Kind.*

WE are now arrived at the laſt and higheſt order of duties reſpecting ſociety, which reſult from the exerciſe of the moſt generous and heroic affections, and are founded on our moſt elegant connections.

The ſocial principle in man is of ſuch an expanſive nature, that it cannot be confined within the circuit of a family, of friends, or a neighbourhood; it ſpreads into wider ſyſtems, and draws men into larger confederacies, communities, and commonwealths.—It is in theſe only that the higher powers of our nature attain the higheſt improvement and perfection of which they are capable. Theſe principles hardly find objects in the ſolitary ſtate of nature. There the principle of action riſes no higher at fartheſt than natural affection towards one's offſpring. There perſonal or family-wants entirely engroſs the creature's attention and labour, and allow no leiſure, or, if they did, no exerciſe for views and affections of a more enlarged kind. In ſolitude all are employed in the ſame way, in providing for the animal life. And even after their utmoſt labour and care, ſingle and unaided by the induſtry of others, they find but a ſorry ſupply of their wants, and a feeble precarious ſecurity againſt dangers from wild beaſts, from inclement ſkies and ſeaſons, from the miſtakes or petulant paſſions of their fellow-creatures, from their preference of themſelves to their neighbours, and from all the little exorbitances of ſelf-love. But in ſociety, the mutual aids which men give and receive ſhorten the labours of each, and the combined ſtrength and reaſon of individuals give ſecurity and protection to the whole body. There is both a variety and ſubordination of genius among mankind. Some are formed to lead and direct others; to contrive plans of happineſs for individuals, and of government for communities; to take in a public intereſt; to invent laws and arts, and ſuperintend their execution; and, in ſhort, to refine and civilize human life. Others, who have not ſuch good heads, may have as honeſt hearts, a truly public ſpirit, love of liberty, hatred of corruption and tyranny, a generous ſubmiſſion to laws, order, and public inſtitutions, and an extenſive philanthropy. And others, who have none of thoſe capacities either of heart, or head, may be well formed for manual exerciſes and bodily labour. The former of theſe principles have no ſcope in ſolitude, where a man's thoughts and concerns do all either center in himſelf, or extend no farther than a family; into which little circle all the duty and virtue of the ſolitary mortal is crouded. But ſociety finds proper objects and exerciſes for every genius, and the nobleſt objects and exerciſes for the nobleſt genuiſes, and for the higheſt principles in the human conſtitution; particularly for that warmeſt and moſt divine paſſion, which God hath kindled in our boſoms, the inclination of doing good, and reverencing our nature; which may find here both employment, and the moſt exquiſite ſatisfaction. In ſociety a man has not only more leiſure, but better opportunities of applying his talents with much greater perfection and ſucceſs, eſpecially as he is furniſhed with the joint advice and aſſiſtance of his fellow-creatures, who are now more cloſely united one with the other, and ſuſtain a common relation to the ſame moral ſyſtem, or community. This then is an object proportioned to his moſt enlarged ſocial affections, and in ſerving it he finds ſcope for the exerciſe and refinement of his higheſt intellectual and moral powers. Therefore ſociety, or a ſtate of civil government, reſts on theſe two principal pillars; "that in it we find ſecurity againſt thoſe evils which are unavoidable in ſolitude; and obtain thoſe goods, ſome of which cannot be obtained at all, and others not ſo well, in that ſtate, where men depend ſolely on their individual ſagacity and induſtry."

From this ſhort detail it appears that man is a ſocial creature, and formed for a ſocial ſtate; and that ſociety, being adapted to the higher principles and deſtinations of his nature, muſt, of neceſſity, be his natural ſtate.

The duties ſuited to that ſtate, and reſulting from thoſe principles and deſtinations, or, in other words, from our ſocial paſſions and ſocial connections, or relation to a public ſyſtem, are love of our country, reſignation and obedience to the laws, public ſpirit, love of liberty, ſacrifice of life and all to the public, and the like.

Love of our country is one of the nobleſt paſſions that can warm and animate the human breaſt. It includes all the limited and particular affections to our parents, children, friends, neighbours, fellow-citizens, countrymen. It ought to direct and limit their more confined and partial actions within their proper and natural bounds, and never let them incroach on thoſe ſacred and firſt regards we owe to the great public to which we belong. Were we ſolitary creatures, detached from the reſt of mankind, and without any capacity of comprehending a public intereſt, or without affections leading us to deſire and purſue it, it would not be our duty to mind it, nor criminal to neglect it. But, as we are parts of the public ſyſtem, and are not only capable of taking in large views of its intereſts, but by the ſtrongeſt affections connected with it, and prompted to take a ſhare of its concerns, we are under the moſt ſacred ties to proſecute its ſecurity and welfare with the utmoſt ardor, eſpecially in times of public trial. This love of our country does not import an attachment to any particular ſoil, climate, or ſpot of earth, where perhaps we firſt drew our breath, though thoſe natural ideas are often aſſociated with the moral ones, and, like external ſigns or ſymbols, help to aſcertain and bind them; but it imports an affection to that moral ſyſtem, or community, which is governed by the ſame laws and magiſtrates, and whoſe ſeveral parts are variouſly connected one with the other, and all united upon the bottom of a common intereſt. Perhaps indeed every member of the community cannot comprehend ſo large an object, eſpecially if it extends through large provinces,

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provinces, and over vaſt tracts of land; and ſtill leſs can he form ſuch an idea, if there is no public, *i. e.* if all are ſubjected to the caprice and unlimited will of one man: but the preference the generality ſhew to their native country, the concern and longing after it which they expreſs when they have been long abſent from it, the labours they undertake and ſufferings they endure to ſave or ſerve it, and the peculiar attachment they have to their countrymen, evidently demonſtrate that the paſſion is natural, and never fails to exert itſelf, when it is fairly diſengaged from foreign clogs, and is directed to its proper object. Where-ever it prevails in its genuine vigour and extent, it ſwallows up all ſordid and ſelfiſh regards; it conquers the love of eaſe, power, pleaſure and wealth; nay, when the amiable partialities of friendſhip, gratitude, private affection, or regard to a family come in competition with it, it will teach us bravely to ſacrifice all, in order to maintain the rights and promote or defend the honour and happineſs of our country.

Reſignation and obedience to the laws and orders of the ſociety to which we belong, are political duties neceſſary to its very being and ſecurity, without which it muſt ſoon degenerate into a ſtate of licence and anarchy. The welfare, nay, the nature of civil ſociety, requires that there ſhould be a ſubordination of orders or diverſity of ranks and conditions in it;—that certain men, or orders of men, be appointed to ſuperintend and manage ſuch affairs as concern the public ſafety and happineſs;—that all have their particular provinces aſſigned them;—that ſuch a ſubordination be ſettled among them, as none of them may interfere with another;—and finally, that certain rules or common meaſures of action be agreed on, by which each is to diſcharge his reſpective duty to govern or be governed, and all may concur in ſecuring the order and promoting the felicity of the whole political body. Thoſe rules of action are the laws of the community; and thoſe different orders are the ſeveral officers, or magiſtrates, appointed by the public to explain them, and ſuperintend or aſſiſt in their execution. In conſequence of this ſettlement of things, it is the duty of each individual to obey the laws enacted, to ſubmit to the executors of them with all due deference and homage according to their reſpective ranks and dignity, as to the keepers of the public peace, and the gurdians of public liberty; to maintain his own rank, and perform the functions of his own ſtation with diligence, fidelity, and incorruption. The ſuperiority of the higher orders, or the authority with which the ſtate has inveſted them, entitle them, eſpecially if they employ their authority well, to the obedience and ſubmiſſion of the lower, and to a proportionable honour and reſpect from all. The ſubordination of the lower ranks claims protection, defence, and ſecurity from the higher. And the laws, being ſuperior to all, require the obedience and ſubmiſſion of all; being the laſt reſort, beyond which there is no deciſion or appeal.

Public ſpirit, heroic zeal, love of liberty, and the other political duties, do, above all others, recommend thoſe who practiſe them to the admiration and homage of mankind; becauſe, as they are the offſpring of the nobleſt minds, ſo are they the parents of the greateſt bleſſings to ſociety. Yet, exalted as they are, it is only in equal and free governments where they can be exerciſed and have their due effect: for there only does a true public prevail, and there only is the public good made the ſtandard of the civil conſtitution. As the end of ſociety is the common intereſt and welfare of the people [illegible], this end muſt of neceſſity be the ſupreme law or common ſtandard by which the particular rules of action of the ſeveral members of the ſociety towards each other are to be regulated. But a common intereſt can be no other than that which is the reſult of the common reaſon, or common feelings of all. Private men, or a particular order of men, have intereſts and feelings peculiar to themſelves, and of which they may be good judges: but theſe may be ſeparate from, and often contrary to the intereſts and feelings of the reſt of the ſociety; and therefore they can have no right to make, much leſs to impoſe, laws on their fellow-citizens, inconſiſtent with, or oppoſite to, thoſe intereſts and thoſe feelings. Therefore a ſociety, a government, a real public, truly worthy the name; and not a confederacy of banditti, a clan of lawleſs ſavages, or a band of ſlaves under the whip of a maſter; muſt be ſuch a one as conſiſts of freemen, chuſing or conſenting to laws themſelves, or, ſince it often happens that they cannot aſſemble and act in a collective body, delegating a ſufficient number of repreſentatives, *i. e.* ſuch a number as ſhall moſt fully comprehend, and moſt equally repreſent, their common feelings and common intereſts, to digeſt and vote laws for the conduct and controul of the whole body the moſt agreeable to thoſe common feelings and common intereſts.

A ſociety thus conſtituted by common reaſon, and formed on the plan of a common intereſt, becomes immediately an object of public attention, public veneration, public obedience, a public and inviolable attachment, which ought neither to be ſeduced by bribes, nor awed by terrors; an object, in fine, of all thoſe extenſive and important duties which ariſe from ſo glorious a confederacy. To watch over ſuch a ſyſtem; to contribute all he can to promote its good by his reaſon, his ingenuity, his ſtrength, and every other ability, whether natural or acquired; to reſiſt, and to the utmoſt of his power defeat, every incroachment upon it, whether carried on by ſecret corruption, or open violence; and to ſacrifice his eaſe, his wealth, his power, nay life itſelf, and, what is dearer ſtill, his family and friends, to defend or ſave it; is the duty, the honour, the intereſt, and the happineſs of every citizen; it will make him venerable and beloved while he lives, be lamented and honoured if he falls in ſo glorious a cauſe, and tranſmit his name with immortal renown to the lateſt poſterity.

As the people are the fountain of power and authority, the original ſeat of majeſty, the authors of laws, and the creators of officers to execute them; if they ſhall find the power they have conferred abuſed by their truſtees, their majeſty violated by tyranny or by uſurpation, their authority proſtituted to ſupport violence or ſcreen corruption, the laws grown pernicious through accidents unforeſeen or unavoidable, or rendered ineffectual thro' the infidelity and corruption of the executors of them; then it is their right, and what is their right is their du-

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ty, to reſume that delegated power, and call their truſtees to an account; to reſiſt the uſurpation, and extirpate the tyranny; to reſtore their ſullied majeſty and proſtituted authority; to ſuſpend, alter, or abrogate thoſe laws, and puniſh their unfaithful and corrupt officers. Nor is it the duty only of the united body, but every member of it ought, according to his reſpective rank, power, and weight in the community, to concur in advancing and ſupporting thoſe glorious deſigns.

Duty to God.

Of all the relations which the human mind ſuſtains, that which ſubſiſts between the Creator and his creatures, the Supreme Lawgiver and his ſubjects, is the higheſt and the beſt. This relation ariſes from the nature of a creature in general, and the conſtitution of the human mind in particular; the nobleſt powers and affections of which point to an Univerſal Mind, and would be imperfect and abortive without ſuch a direction. How lame then muſt that ſyſtem of morals be, which leaves a Deity out of the queſtion! How diſconſolate, and how deſtitute of its firmeſt ſupport!

It does not appear, from any true hiſtory or experience of the mind's progreſs, that any man, by any formal deduction of his diſcurſive powers, ever reaſoned himſelf into the belief a God. Whether ſuch a belief is only ſome natural anticipation of ſoul; or is derived from father to ſon, and from one man to another, in the way of tradition; or is ſuggeſted to us in conſequence of an immutable law of our nature, on beholding the auguſt aſpect and beautiful order of the univerſe; we will not pretend to determine. What ſeems moſt agreeable to experience is, that a ſenſe of its beauty and grandeur, and the admirable fitneſs of one thing to another in its vaſt apparatus, leads the mind neceſſarily and unavoidably to a perception of deſign, or of a deſigning cauſe, the origin of all, by a progreſs as ſimple and natural as that by which a beautiful picture or a fine building ſuggeſts to us the idea of an excellent artiſt. For it ſeems to hold univerſally true, that where-ever we diſcern a tendency or cooperation of things towards a certain end, or producing a common effect; there, by a neceſſary law of aſſociation, we apprehend deſign, a deſigning energy or cauſe: *See* METAPHYSICS. As we conceive this Being or Firſt Cauſe before all, above all, and greater than all, we naturally, and without reaſoning, aſcribe to him every kind of perfection, wiſdom, power, and goodneſs without bounds, exiſting through all time, and pervading all ſpace. We apply to him thoſe glorious epithets of our Creator, Preſerver, Benefactor, the Supreme Lord and Law-giver of the whole ſociety of rational intelligent creatures.—Not only the imperfections and wants of our being and condition, but ſome of the nobleſt inſtincts and affections of our minds, connect us with this great and univerſal nature. The mind, in its progreſs from object to object, from one character and proſpect of beauty to another, finds ſome blemiſh or deficiency in each, and ſoon exhauſts or grows weary and diſſatisfied with its ſubject: it ſees no character of excellency among men, equal to that pitch of eſteem which it is capable of exerting; no object within the compaſs of human things adequate to the ſtrength of its affection. Nor can it ſtop any where in this ſelf-expanſive progreſs, or find repoſe after its higheſt flights, till it arrives at a Being of unbounded greatneſs and worth, on whom it may employ its ſublimeſt powers without exhauſting the ſubject, and give ſcope to the utmoſt force and fullneſs of its love without ſatiety or diſguſt. So that the nature of this Being correſponds to the nature of man; nor can his intelligent and moral powers obtain their entire end, but on the ſuppoſition of ſuch a Being, and without a real ſympathy and communication with him. The native propenſity of the mind to reverence whatever is great and wonderful in nature, finds a proper object of homage in him who ſpread out the heavens and the earth, and who ſuſtains and governs the whole of things. The admiration of beauty, the love of order, and the complacency we feel in goodneſs, muſt riſe to the higheſt pitch, and attain the full vigour and joy of their operations, when they unite in Him who is the ſum and ſource of all perfection.

It is evident, from the ſlighteſt ſurvey of morals, that how punctual ſoever one may be in performing the duties which reſult from our relations to mankind; yet to be quite deficient in performing thoſe which ariſe from our relation to the Almighty, muſt argue a ſtrange perverſion of reaſon or depravity of heart. If imperfect degrees of worth attract our veneration, and if the want of it would imply an inſenſibility, or, which is worſe, an averſion to merit; what lameneſs of affection, and immorality of character, muſt it be, to be unaffected with, and much more to be ill-affected to, a Being of ſuperlative worth! To love ſociety, or particular members of it, and yet to have no ſenſe of our connection with its Head, no affection to our common Parent and Benefactor; to be concerned about the approbation or cenſure of our fellow-creatures, and yet to feel nothing of this kind towards Him who ſees and weighs our actions with unerring wiſdom and juſtice, and can fully reward or puniſh them; betrays equal madneſs and partiality of mind. It is plain, therefore, beyond all doubt, that ſome regards are due to the great Father of all, in whom every lovely and adorable quality combines to inſpire veneration and homage.

As it has been obſerved already, that our affections depend on our opinions of their objects, and generally keep pace with them, it muſt be of the higheſt importance, and ſeems to be among the firſt duties we owe to the Author of our being, "to form the leaſt imperfect, ſince we cannot form perfect conceptions of his character and adminiſtration." For ſuch conceptions, thoroughly imbibed, will render our religion rational, and our diſpoſitions refined. If our opinions are diminutive and diſtorted, our religion will be ſuperſtitious, and our temper abject. The foundation, then, of all true religion is a rational faith. And of a rational faith theſe ſeem to be the chief articles: To believe, "that an infinite all-perfect Mind exiſts, who has no oppoſite nor any ſeparate intereſt from that of his creatures:—that he ſuperintends and governs all creatures and things:—that his goodneſs extends to all his creatures, in different degrees indeed, according to their reſpective natures, but without any partiality or envy:—that he does every thing for the beſt,

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or in a ſubſerviency to the perfection and happineſs of the whole;—particularly, that he directs and governs the affairs of men,—inſpects their actions,—diſtinguiſhes the good from the bad,—loves and befriends the former,—is diſpleaſed with and pities the latter in this world.—will, according to their reſpective deſerts, reward the one, and puniſh the other in the next:—that, in fine, he always carrying on a ſcheme of virtue and happineſs through an unlimited duration,—and is ever guiding the univerſe through its ſucceſſive ſtages and periods, to higher degrees of perfection and felicity." This is true theiſm, the glorious ſcheme of divine faith; a ſcheme exhibited in all the works of God, and executed through his whole adminiſtration.

This faith, well-founded and deeply felt, is nearly connected with a true moral taſte, and hath a powerful efficacy on the temper and manners of the theiſt. He who admires goodneſs in others, and delights in the practice of it, muſt be conſcious of a reigning order within, a rectitude and candor of heart which diſpoſes him to entertain favourable apprehenſions of men, and, from an impartial ſurvey of things, to preſume that good order and good meaning prevail in the univerſe; and if good meaning and good order, then an ordering and intending Mind, who is no enemy, no tyrant to his creatures, but a friend, a benefactor, an indulgent ſovereign.—On the other hand, a bad man, having nothing goodly or generous to contemplate within, no right intentions, nor honeſty of heart, ſuſpects every perſon and every thing; and beholding nature through the gloom of a ſelfiſh and guilty mind, is either averſe to the belief of a reigning order; or, if he cannot ſuppreſs the unconquerable anticipations of a governing mind, he is prone to tarniſh the beauty of nature, and to impute malevolence, or blindneſs and impotence at leaſt, to the Sovereign Ruler. He turns the univerſe into a forlorn and horrid waſte; and transfers his own character to the Deity, by aſcribing to him that uncommunicative grandeur, that arbitrary or revengeful ſpirit which he affects or admires in himſelf. As ſuch a temper of mind naturally leads to atheiſm, or to a ſuperſtition full as bad; therefore, as far as that temper depends on the unhappy creature in whom it prevails, the propenſity to atheiſm or ſuperſtition conſequent thereto muſt be immoral. Farther, if it be true that the belief or ſenſe of a Deity is natural to the mind, and the evidence of his exiſtence reflected from his works ſo full as to ſtrike even the moſt ſuperficial obſerver with conviction; then the ſupplanting or corrupting that ſenſe, or the want of due attention to that evidence, and, in conſequence of both, a ſupine ignorance or affected unbelief of a Deity, muſt argue a bad temper, or an immoral turn of mind. In the caſe of invincible ignorance, or a very bad education, though nothing can be concluded directly againſt the character, yet whenever ill paſſions and habits pervert the judgment, and by perverting the judgment terminate in atheiſm, then the caſe becomes plainly criminal.

But let caſuiſts determine this as they will, a true faith in the divine character and adminiſtration is generally the conſequence of a virtuous ſtate of mind. The man who is truly and habitually good, feels the love of order, of beauty, and goodneſs, in the ſtrongeſt degree; and therefore cannot be inſenſible to thoſe emanations of them which appear in all the works of God, nor help loving their Supreme Source and Model. He cannot but think, that He who has poured ſuch beauty and goodneſs over all his works, muſt Himſelf delight in beauty and goodneſs, and what He delights in muſt be both amiable and happy. Some indeed there are, and it is pity there ſhould be any ſuch, who, through the unhappy influence of a wrong education, have entertained dark and unfriendly thoughts of a Deity and his adminiſtration, though otherwiſe of a virtuous temper themſelves. However, it muſt be acknowledged, that ſuch ſentiments have, for the moſt part, a bad effect on the temper; and when they have not, it is becauſe the undepraved affections of an honeſt heart are more powerful in their operation, than the ſpeculative opinions of an ill-formed head.

But where-ever right conceptions of the Deity and his providence prevail, when he is conſidered as the inexhauſted ſource of light and love and joy, as acting in the joint character of a father and governor, imparting an endleſs variety of capacities to his creatures, and ſupplying them with every thing neceſſary to their full completion and happineſs, what veneration and gratitude muſt ſuch conceptions thoroughly believed excite in the mind! How natural and delightful muſt it be to one whoſe heart is open to the perception of truth, and of every thing fair, great, and wonderful in nature, to contemplate and adore Him, who is the Firſt Fair, the Firſt Great, and Firſt Wonderful; in whom wiſdom, power and goodneſs dwell vitally, eſſentially, originally, and act in perfect concert! What grandeur is here to fill the moſt enlarged capacity, what beauty to engage the moſt ardent love, what a maſs of wonders in ſuch exuberance of perfection, to aſtoniſh and delight the human mind through an unfailing duration!

If the Deity is conſidered as our ſupreme guardian and benefactor, as the father of mercies, who loves his creatures with infinite tenderneſs, and in a particular manner all good men, nay, who delights in goodneſs even in its moſt imperfect degrees; what reſignation, what dependence, what generous confidence, what hope in God and his all-wiſe providence, muſt ariſe in the ſoul that is poſſeſſed of ſuch amiable views of him! All thoſe exerciſes of piety, and above all a ſuperlative eſteem and love, are directed to God as to their natural, their ultimate, and indeed their only adequate object: and though the immenſe obligations we have received from him may excite in us more lively feelings of divine goodneſs than a general and abſtracted contemplation of it; yet the affections of gratitude and love are themſelves of the generous diſintereſted kind, not the reſult of ſelf intereſt, or views of reward. A perfect character, in which we always ſuppoſe infinite goodneſs, guided by unerring wiſdom, and ſupported by almighty power, is the proper object of perfect love; and though that character ſuſtains to us the relation of a benefactor, yet the mind, deeply ſtruck with that perfection, is quite loſt amidſt ſuch a blaze of beauty,

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ty, and grows as it were inſenſible to thoſe minuter irradiations of it upon itſelf. To talk, therefore, of a mercenary love of God, or which has fear for its principal ingredient, is equally impious and abſurd. If we do not love the loveliеſt object in the univerſe for his own ſake, no proſpect of good or fear of ill can ever bribe our eſteem, or captivate our love. Theſe affections are too noble to be bought or ſold, or bartered in the way of gain; worth, or merit, as their object, and their reward is ſomething ſimilar in kind. Whoever indulges ſuch ſentiments and affections towards the Deity, muſt be confirmed in the love of virtue, in a deſire to imitate its all-perfect Pattern, and in a cheerful ſecurity that all his great concerns, thoſe of his friends and of the univerſe, ſhall be abſolutely ſafe under the conduct of unerring wiſdom and unbounded goodneſs. It is in his care and providence alone that the good man, who is anxious for the happineſs of all, finds perfect ſerenity, a ſerenity neither ruffled by partial ill, nor ſoured by private diſappointment.

When we conſider the unſtained purity and abſolute perfection of the divine nature, and reflect withal on the imperfection and various blemiſhes of our own, we muſt ſink, or be convinced we ought to ſink, into the deepeſt humility and proſtration of ſoul before Him who is ſo wonderfully great and holy. When, farther, we call to mind what low and languid feelings we have of the Divine Preſence and Majeſty; what inſenſibility of his fatherly and univerſal goodneſs, nay, what ungrateful returns we have made to it; how far we come ſhort of the perfection of his law, and the dignity of our own nature; how much we have indulged to the ſelfiſh paſſions, and how little to the benevolent ones; we muſt be conſcious that it is our duty to repent of a temper and conduct ſo unworthy our nature, and unbecoming our obligations to its Author, and to reſolve and endeavour to act a wiſer and better part for the future.

Nevertheleſs, from the character which his works exhibit of him, from thoſe delays or alleviations of puniſhment which offenders often experience, and from the merciful tenour of his adminiſtration in many other inſtances, the ſincere penitent may entertain good hopes that his Parent and Judge will not be ſtrict to mark iniquity, but will be propitious and favourable to him, if he honeſtly endeavours to avoid his former practices, and ſubdue his former habits, and to live in a greater conformity to the divine will for the future. If any doubts or fears ſhould ſtill remain, how far it may be conſiſtent with the rectitude and equity of the divine government to let his iniquities paſs unpuniſhed; yet he cannot think it unſuitable to his paternal clemency and wiſdom to contrive a method of retrieving the penitent offender, that ſhall unite and reconcile the majeſty and mercy of his government. If reaſon cannot of itſelf ſuggeſt ſuch a ſcheme, it gives at leaſt ſome ground to expect it. But though natural religion cannot let in more light and aſſurance on ſo intereſting a ſubject, yet it will teach the humble theiſt to wait with great ſubmiſſion for any farther intimations it may pleaſe the Supreme Governor to give of his will; examine with candour and impartiality whatever evidence ſhall be propoſed to him of a divine revelation, whether that evidence is natural or ſupernatural; to embrace it with veneration and cheerfulneſs, if the evidence is clear and convincing; and finally, if it bring to light any new relations or connections, natural religion will perſuade its ſincere votary faithfully to comply with the obligations, and perform the duties which reſult from thoſe relations and connections. —This is theiſm, piety, the completion of morality!

We muſt further obſerve, that all thoſe affections which we ſuppoſed to regard the Deity as their immediate and primary object, are vital energies of the ſoul, and conſequently exert themſelves into act; and like all its other energies, gain ſtrength or greater activity by that exertion. It is therefore our duty, as well as higheſt intereſt, often, at ſtated times, and by decent and ſolemn acts, to contemplate and adore the great Original of our exiſtence, the Parent of all beauty, and of all good; to expreſs our veneration and love, by an awful and devout recognition of his perfections; and to evidence our gratitude, by celebrating his goodneſs, and thankfully acknowledging all his benefits. It is likewiſe our duty, by proper exerciſes of ſorrow and humiliation, to confeſs our ingratitude and folly; to ſignify our dependence on God, and our confidence in his goodneſs, by imploring his bleſſing and gracious concurrence in aſſiſting the weakneſs, and curing the corruptions of our nature; and finally, to teſtify our ſenſe of his authority, and our faith in his government, by devoting ourſelves to do his will, and reſigning ourſelves to his diſpoſal. Theſe duties are not therefore obligatory, becauſe the Deity needs or can be profited by them; but as they are apparently decent and moral; ſuitable to the relations he ſuſtains of our Creator, Benefactor, Law-giver and Judge; expreſſive of our ſtate and obligations; and improving to our tempers, by making us more rational, ſocial, godlike, and conſequently more happy.

We have now conſidered internal piety, or the worſhip of the mind, that which is in ſpirit and in truth; we ſhall conclude the ſection with a ſhort account of that which is external. External worſhip is founded on the ſame principles as internal, and of a ſtrict moral oligation. It is either private or public. Devotion, that is inward, or purely intellectual, is too ſpiritual and abſtracted an operation for the bulk of mankind. The operations of their minds, ſuch eſpecially as are employed on the moſt ſublime immaterial objects, muſt be aſſiſted by their outward organs, or by ſome help from the imagination, otherwiſe they will be ſoon diſſipated by ſenſible impreſſions, or grow tireſome if too long continued. Ideas are ſuch fleeting things that they muſt be fixed, and ſo ſubtle that they muſt be expreſſed and delineated, as it were, by ſenſible marks and images; otherwiſe we cannot attend at them, nor be much affected to them. Therefore verbal adoration, prayer, praiſe, thankſgiving, and confeſſion, are admirable aids to inward devotion, fix our attention, compoſe and enliven our thoughts, impreſs us more deeply with a ſenſe of the awful preſence in which we are, and, by a natural and mechanical ſort of influence, tend to heighten thoſe devout feelings and affections which we ought to entertain, and after this manner reduce into formal and explicit act.

This holds true in an higher degree in the caſe of public worſhip, where the preſence of our fellow-creatures, and the powerful contagion of the ſocial affections, conſpire to kindle and ſpread the devout flame with greater

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energy. To conclude: As God is the parent and head of the ſocial ſyſtem; as he has formed us for a ſocial ſtate; as by one we find the beſt ſecurity againſt the ills of life, and in the other enjoy its greateſt comforts; and as, by means of both, our nature attains its higheſt improvement and perfection; and moreover, as there are public bleſſings and crimes in which we all ſhare in ſome degree, and public wants and dangers to which all are expoſed; it is therefore evident, that the various and ſolemn offices of public religion, are duties of indiſpenſable moral obligation, among the beſt cements of ſociety, the firmeſt prop of government, and the faireſt ornament of both.

Of Practical Ethics, *or the* Culture *of the* Mind.

We have now gone through a particular detail of the ſeveral duties we owe to ourſelves, to ſociety, and to God. In conſidering the firſt order of duties, we juſt touched on the methods of acquiring the different kinds of goods which we are led by nature to purſue; only we left the conſideration of the method of acquiring the moral goods of the mind to a ſection by itſelf, becauſe of its ſingular importance. This ſection, then, will contain a brief enumeration of the arts of acquiring virtuous habits, and of eradicating vitious ones, as far as is conſiſtent with the brevity of ſuch a work; a ſubject of the utmoſt difficulty as well as importance in morals; to which, nevertheleſs, the leaſt attention has been generally given by moral writers, eſpecially thoſe of a modern date. This will properly follow a detail of duty, as it will direct us to ſuch means or helps as are moſt neceſſary and conducive to the practice of it.

In the firſt part of this inquiry we traced the order in which the paſſions ſhoot up in the different periods of human life. That order is not accidental, nor dependent on the caprice of men, or the influence of cuſtom and education; but ariſes from the original conſtitution and laws of our nature; of which this is one, *viz.* "That ſenſible objects make the firſt and ſtrongeſt impreſſions on the mind." Theſe, by means of our outward organs, being conveyed to the mind, become objects of its attention, on which it reflects when the outward objects are no longer preſent, or, in other words, when the impreſſions upon the outward organs ceaſe. Theſe objects of the mind's reflection are called *ideas* or *images*. Towards theſe, by another law of our nature, we are not altogether indifferent; but correſpondent movements of deſire or averſion, love or hatred, ariſe, according as the objects of which they are images or copies made an agreeable or diſagreeable impreſſion on our organs. Thoſe ideas and affections which we experience in the firſt period of life, we refer to the body, or to ſenſe; and the taſte which is formed towards them, we call a *ſenſible*, or a *merely natural* taſte; and the objects correſponding to them we in general call *good* or *pleaſant*.

But, as the mind moves forward in its courſe, it extends its views, and receives a new and more complex ſet of ideas, in which it obſerves uniformity, variety, ſimilitude, ſymmetry of parts, reference to an end, novelty, grandeur. Theſe compoſe a vaſt train and diverſity of imagery, which the mind compounds, divides, and moulds into a thouſand forms, in the abſence of thoſe objects which firſt introduced it. And this more complicated imagery ſuggeſts a new train of deſires and affections, full as ſprightly and engaging as any which have yet appeared. This whole claſs of perceptions or impreſſions is referred to the imagination, and forms an higher taſte than the ſenſible, and which has an immediate and mighty influence on the finer paſſions of our nature, and is commonly termed a *fine taſte*.

The objects which correſpond to this taſte we uſe to call beautiful, harmonious, great, or wonderful, or, in general, by the name of *beauty*.

The mind ſtill puſhing onwards, and increaſing its ſtock of ideas, aſcends from thoſe to an higher ſpecies of objects, *viz.* the order and mutual relations of minds to each other, their reciprocal affections, characters, actions, and various aſpects. In theſe it diſcovers a beauty, a grandeur, a decorum more intereſting and alluring than in any of the former kinds. Theſe objects, or the images of them, paſſing in review before the mind, do, by a neceſſary law of our nature, call forth another and nobler ſet of affections, as admiration, eſteem, love, honour, gratitude, benevolence, and others of the like tribe. This claſs of perceptions, and their correſpondent affections, we refer, becauſe of their objects (manners,) to a moral ſenſe; and call the taſte or temper they excite, *moral*: and the objects which are agreeable to this taſte or temper we denominate by the general name of *moral beauty*; in order to diſtinguiſh it from the other, which is termed *natural*.

Theſe different ſets of ideas or images are the materials about which the mind employs itſelf; which it blends, ranges, and diverſifies ten thouſand different ways. It feels a ſtrong propenſion to connect and aſſociate thoſe ideas among which it obſerves any ſimilitude, or any aptitude, whether original and natural, or cuſtomary and artificial, to ſuggeſt each other. See Metaphysics.

But whatever the reaſons are, whether ſimilitude, coexiſtence, caſuality, or any other aptitude or relation, why any two or more ideas are connected by the mind at firſt, it is an eſtabliſhed law of our nature, "That when two or more ideas have often ſtarted in company, they form ſo ſtrong an union, that it is very difficult ever after to ſeparate them." Thus the lover cannot ſeparate the idea of merit from his miſtreſs; the courtier that of dignity from his title or ribbon; the miſer that of happineſs from his bags.—It is theſe aſſociations of worth or happineſs with any ſet of objects or images that form our taſte or complex idea of good. By another law of our nature, "our affections follow and are governed by this taſte; and to theſe affections our character and conduct are ſimilar and proportioned, on the general tenor of which our happineſs principally depends."

As all our leading paſſions, then, depend on the direction which our taſte takes, and as it is always of the ſame ſtrain with our leading aſſociations, it is worth while to inquire a little more particularly how theſe are formed, in order to detect the ſecret ſources from whence our paſſions derive their principal ſtrength, their various riſes

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and falls. For this will give us the true key to their management, and let us into the right method of correcting the bad, and improving the good.

No kind of objects makes ſo powerful an impreſſion on us as thoſe which are immedirtely impreſſed on our ſenſes, or ſtrongly painted on our imaginations. Whatever is purely intellectual, as abſtracted or ſcientific truths, the ſubtle relations and difference of things, has a fainter ſort of exiſtence in the mind; and, though it may exerciſe and whet the memory, the judgment, or the reaſoning powers, gives hardly any impulſe at all to the active powers, the paſſions, which are the main ſprings of motion. On the other hand, were the mind entirely under the direction of ſenſe, and impreſſible only by ſuch objects as are preſent and ſtrike ſome of the outward organs, we ſhould then be preciſely in the ſtate of the brute creation, and be governed ſolely by inſtinct or appetite, and have no power to controul whatever impreſſions are made upon us. Nature has therefore endued us with a middle faculty, wonderfully adapted to our mixed ſtate; which holds partly of ſenſe, and partly of reaſon; being ſtrongly allied to the former, and the common receptacle in which all the notices that come from that quarter are treaſured up; and yet greatly ſubſervient and miniſterial to the latter, by giving a body, a coherence, and beauty to its conceptions. This middle faculty is called the *imagination*, one of the moſt buſy and fruitful powers of the mind. Into this common ſtorehouſe are likewiſe carried all thoſe moral images or forms which are derived from our moral faculties of perception; and there they often undergo new changes and appearances, by being mixed and wrought up with the images and forms of ſenſible or natural things. By this coalition of imagery, natural beauty is dignified and heightened by moral qualities and perfections, and moral qualities are at once exhibited and ſet off by natural beauty. The ſenſible beauty, or good, is refined from its droſs by partaking of the moral; and the moral receives a ſtamp, a viſible character and currency from the ſenſible.

As we are firſt of all accuſtomed to ſenſible impreſſions and ſenſible enjoyments, we contract early a ſenſual reliſh or love of pleaſure in the lower ſenſe of the word. In order, however, to juſtify this reliſh, the mind, as it becomes open to higher perceptions of beauty and good, borrows from thence a nobler ſet of images, as fine taſte, generoſity, ſocial affection, friendſhip, good-fellowſhip, and the like; and, by dreſſing out the old purſuits with theſe new ornaments, gives them an additional dignity and luſtre. By theſe ways the deſire of a table, love of finery, intrigue, and pleaſure, are vaſtly increaſed beyond their natural pitch, having an impulſe combined of the force of the natural appetites and of the ſuperadded ſtrength of thoſe paſſions which tend to the moral ſpecies. —When the mind becomes more ſenſible to thoſe objects or appearances, in which it perceives beauty, uniformity, grandeur, and harmony, as fine cloaths, elegant furniture, plate, pictures, gardens, houſes, equipage, the beauty of animals, and particularly the attractions of the ſex; to theſe objects the mind is led by nature, or taught by cuſtom, the opinion and example of others, to annex certain ideas of moral character, dignity, decorum, honour, liberality, tenderneſs, and active or ſocial enjoyment. The conſequence of this aſſociation is, that the objects to which theſe are annexed, muſt riſe in their value, and be purſued with proportionable ardor. The enjoyment of them is often attended with pleaſure; and the mere poſſeſſion of them, where that is wanting, frequently draws reſpect from one's fellow-creatures: this reſpect is, by many, thought equivalent to the pleaſure of enjoyment. Hence it happens, that the idea of happineſs is connected with the mere poſſeſſion; which is therefore eagerly ſought after, without any regard to the generous uſe, or honourable enjoyment. Thus the paſſion reſting on the means, not the end, *i. e.* loſing ſight of its natural object, becomes wild and extravagant.

In fine, any object, or external denomination, a ſtaff, a garter, a cup, a crown, a title, may become a moral badge or emblem of merit, magnificence, or honour, according as theſe have been found or thought by the poſſeſſors or admirers of them to accompany them; yet, by the deception formerly mentioned, the merit or the conduct which entitled, or ſhould entitle, to thoſe marks of diſtinction, ſhall be forgot or neglected, and the badges themſelves be paſſionately affected, or purſued, as including every excellency. If theſe are attained by any means, all the concomitants which nature, cuſtom, or accidents have joined to them, will be ſuppoſed to follow of courſe. Thus moral ends, with which the unhappy admirer is apt to colour over his paſſion and views, will, in his opinion, juſtify the moſt immoral means, as proſtitution, adulation, fraud, treachery, and every ſpecies of knavery, whether more open or more diſguiſed.

When men are once engaged in active life, and find that wealth and power, generally called *intereſt*, are the great avenues to every kind of enjoyment, they are apt to throw in many engaging moral forms to the object of their purſuit, in order to juſtify their paſſion, and varniſh over the meaſures they take to gratify it; as, independency on the vices or paſſions of others, proviſion and ſecurity to themſelves and friends, prudent oeconomy or well-placed charity, ſocial communication, ſuperiority to their enemies who are all villains, honourable ſervice, and many other ingredients of merit. To attain ſuch capacities of uſefulneſs or enjoyment, what arts, nay, what meanneſſes can be thought blameable by thoſe cool purſuers of intereſt!——Nor have they, whom the gay world is pleaſed to indulge with the title of *men of pleaſure*, their imaginations leſs pregnant with moral images, with which they never fail to ennoble, or, if they cannot do that, to palliate their groſs purſuits. Thus, admiration of wit, of ſentiments and merit, friendſhip, love, generous ſympathy, mutual confidence, giving and receiving pleaſure, are the ordinary ingredients with which they ſeaſon their gallantry and pleaſurable entertainments; and by which they impoſe on themſelves, and endeavour to impoſe on others, that their amours are the joint iſſue of good ſenſe and virtue.

Theſe aſſociations, variouſly combined and proportioned by the imagination, form the chief private paſſions which govern the lives of the generality; as the love of action, of pleaſure, power, wealth, and fame: they influence the defenſive, and affect the public paſſions, and raiſe

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joy or ſorrow, as they are gratified or diſappointed. So that, in effect, theſe aſſociations of good and evil, beauty and deformity, and the paſſions they raiſe, are the main hinges of life and manners, and the great ſources of our happineſs or miſery. It is evident, therefore, that the whole of moral culture muſt depend on giving a right direction to the leading paſſions, and duly proportioning them to the value of the objects or goods purſued, under what name ſoever they may appear.

Now, in order to give them this right direction and due proportion, it appears, from the foregoing detail, that thoſe aſſociations of ideas, upon which the paſſions depend, muſt be duly regulated: that is to ſay, as an exorbitant paſſion for wealth, pleaſure, or power, flows from an aſſociation or opinion that more beauty and good, whether natural or moral, enters into the enjoyment or poſſeſſion of them, than really belongs to either; therefore, in reſtoring thoſe paſſions to their juſt proportion, we muſt begin with correcting the opinion, or breaking the falſe aſſociation; or, in other words, we muſt decompound the complex phantom of happineſs or good, which we fondly admire; diſunite thoſe ideas, that have no natural alliance; and ſeparate the original idea of wealth, power, or pleaſure, from the foreign mixtures incorporated with it, which enhance its value, or give it its chief power to enchant and ſeduce the mind. For inſtance, let it be conſidered how poor and inconſiderable a thing wealth is, if it be diſjoined from real uſe, or from ideas of capacity in the poſſeſſor to do good, from independency, generoſity, proviſion for a family or friends, and ſocial communication with others. By this ſtandard let its true value be fixed; let its miſapplication, or unbenevolent enjoyment, be accounted ſordid and infamous; and nothing worthy or eſtimable be aſcribed to the mere poſſeſſion of it, which is not borrowed from its generous uſe.

If that complex form of good which is called *pleaſure*, engages us, let it be analyſed into its conſtituent principles, or thoſe allurements it draws from the heart and imagination, in order to heighten the low part of the indulgence; let the ſeparate and comparative moment of each be diſtinctly aſcertained, and deduced from that groſs part; and this remainder of the accumulative enjoyment will dwindle down into a poor, inſipid, tranſitory thing. In proportion as the opinion of the good purſued abates, the admiration muſt decay, and the paſſion loſe ſtrength of courſe. One effectual way to lower the opinion, and conſequently to weaken the habit founded on it, is to practice leſſer pieces of ſelf-denial, or to abſtain, to a certain pitch, from the purſuit or enjoyment of the favourite object; and, that this may be the more eaſily accompliſhed, one muſt avoid thoſe occaſions, that company, thoſe places, and the other circumſtances that inflamed one, and endeared the other: And, as a counter-proceſs, let higher or even different enjoyments be brought in view, other paſſions played upon the former, different places frequented, other exerciſes tried, company kept with perſons of a different or more correct way of thinking both in natural and moral ſubjects.

As much depends on our ſetting out well in life, let the youthful fancy, which is apt to be very florid and luxuriant, be early accuſtomed, by inſtruction, example, and ſignificant moral exerciſes, nay, by looks, geſtures, and every other teſtimony of juſt approbation or blame, to annex ideas of merit, honour, and happineſs—not to birth, dreſs, rank, beauty, fortune, power, popularity, and the like outward things,—but to moral and truly virtuous qualities, and to thoſe enjoyments which ſpring from a well-informed judgment, and a regular conduct of the affections, eſpecially thoſe of the ſocial and diſintereſted kind. Such dignified forms of beauty and good, often ſuggeſted, and, by moving pictures and examples, warmly recommended to the imagination, enforced by the authority of conſcience, and demonſtrated by reaſon to be the ſureſt means of enjoyment, and the only independent, undeprivable and durable goods, will be the beſt counter-balance to meaner paſſions, and the firmeſt foundation and ſecurity to virtue.

It is of great importance to the forming a juſt taſte, or pure and large conceptions of happineſs, to ſtudy and underſtand human nature well, to remember what a complicated ſyſtem it is, particularly to have deeply imprinted on our mind that gradation of ſenſes, faculties, and powers of enjoyment formerly mentioned, and the ſubordination of goods reſulting from thence, which nature points out, and the experience of mankind confirms; who, when they think ſeriouſly, and are not under the immediate influence of ſome violent prejudice or paſſion, prefer not the pleaſures of action, contemplation, ſociety, and moſt exerciſes and joys of the moral kind, as friendſhip, natural affection, and the like, to all ſenſual gratifications whatſoever? Where the different ſpecies of pleaſure are blended into one complex form, let them be accurately diſtinguiſhed, and be referred each to its proper faculty and ſenſe, and examined apart what they have peculiar, what common with others, and what foreign and adventitious. Let wealth, grandeur, luxury, love, fame, and the like, be tried by this teſt, and their true alloy will be found out.—Let it be farther conſidered, whether the mind may not be eaſy, and enjoy itſelf greatly, though it want many of thoſe elegancies and ſuperfluities of life which ſome poſſeſs, or that load of wealth and power which others eagerly purſue, and under which they groan. Let the difficulty of attaining, the precarioufneſs of poſſeſſing, and the many abatements in enjoying overgrown wealth and envied greatneſs, of which the weary poſſeſſors ſo frequently complain, as the hurry of buſineſs, the burden of company, of paying attendance to the few, and giving it to the many, the cares of keeping, the fears of loſing, and the deſires of increaſing what they have, and the other troubles which accompany this pitiful drudgery and pompous ſervitude; let theſe and the like circumſtances be often conſidered that are conducive to the removing or leſſening the opinion of ſuch goods, and the attendant paſſion or ſet of paſſions will decay of courſe.

Let the peculiar bent of our nature and character be obſerved, whether we are moſt inclined to form aſſociations and reliſh objects of the ſenſible, intellectual, or moral kind. Let that which has the aſcendant be particularly watched; let it be directed to right objects, be improved by proportioned exerciſes, and guarded by proper checks from an oppoſite quarter. Thus, the ſenſible

turn.

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turn may be exalted by the intellectual and a taſte for the beauty of the fine arts, and both may be made ſubſervient to convey and rivet ſentiments highly moral and public-ſpirited. This inward ſurvey muſt extend to the ſtrength and weakneſſes of one's nature, one's condition, connections, habitudes, fortune, ſtudies, acquaintance, and the other circumſtances of one's life; from which every man will form the juſteſt eſtimate of his own diſpoſitions and character, and the beſt rules for correcting and improving them. And, in order to do this with more advantage, let thoſe times or critical ſeaſons be watched when the mind is beſt diſpoſed towards a change, and let them be improved by vigorous reſolutions, promiſes, or whatever elſe will engage the mind to perſevere in virtue. Let the conduct, in fine, be often reviewed, and the cauſes of its corruption or improvement be carefully obſerved.

It will greatly conduce to refine the moral taſte and ſtrengthen the virtuous temper, to accuſtom the mind to the frequent exerciſe of moral ſentiments and determinations, by reading hiſtory, poetry, particularly of the picturesque and dramatic kind, the ſtudy of the fine arts; by converſing with the moſt eminent for good-ſenſe and virtue; but, above all, by frequent and repeated acts of humanity, compaſſion, friendſhip, politeneſs, and hoſpitality. It is exerciſe gives health and ſtrength. He that reaſons moſt frequently, becomes the wiſeſt, and moſt enjoys the pleaſures of wiſdom. He who is moſt often affected by objects of compaſſion in poetry, hiſtory, or real life, will have his ſoul moſt open to pity and its delightful pains and duties. So he alſo who practiſes moſt diligently the offices of kindneſs and charity, will by it cultivate that diſpoſition, from whence all his pretenſions to perſonal merit muſt ariſe, his preſent and his future happineſs.

An uſeful and honourable employment in life will adminiſter a thouſand opportunities of this kind, and greatly ſtrengthen a ſenſe of virtue and good affections, which muſt be nouriſhed by right training, as well as our underſtandings. For ſuch an employment, by enlarging one's experience, giving an habit of attention and caution, or obliging one, from neceſſity or intereſt, to keep a guard over the paſſions, and ſtudy the outward decencies and appearancies of virtue, will by degrees produce good habit, and at length inſinuate the love of virtue and honeſty for its own ſake.

It is a great inducement to the exerciſe of benevolence, to view human nature in a favourable light, to obſerve the characters and circumſtances of mankind on the faireſt ſides, to put the beſt conſtructions on their actions they will bear, and to conſider them as the reſult of partial and miſtaken, rather than ill affections, or, at worſt, as the exceſſes of a pardonable ſelf-love, ſeldom or never the effects of pure malice.

Above all, the nature and conſequences of virtue and vice, their conſequences being the law of our nature and will of heaven; the light in which they appear to our ſupreme Parent and Law-giver, and the reception they will meet with from him; muſt be often attended to. The exerciſes of piety, as adoration and praiſe of the Divine Excellency, invocation of and dependence on his aid, confeſſion, thankſgiving, and reſignation, are habitually to be indulged, and frequently performed, not only as medicinal, but highly improving to the temper.

To conclude: It will be of admirable efficacy towards eradicating bad habits, and implanting good ones, frequently to contemplate human life as the great nurſery of our future and immortal exiſtence, as that ſtate of probation in which we are to be educated for a divine life; to remember that our virtues or vices will be immortal as ourſelves, and influence our future as well as our preſent happineſs, and therefore that every diſpoſition and action is to be regarded as pointing beyond the preſent to an immortal duration. An habitual attention to this wide and important connection will give a vaſt compaſs and dignity to our ſentiments and actions, a noble ſuperiority to the pleaſures and pains of life, and a generous ambition to make our virtue as immortal as our being.

Motives to Virtue from perſonal Happineſs.

We have already conſidered our obligations to the practice of virtue, ariſing from the conſtitution of our nature, by which we are led to approve a certain order and œconomy of affections, and a certain courſe of action correſpondent to it.—But beſides this, there are ſeveral motives which ſtrengthen and ſecure virtue, though not themſelves of a moral kind. Theſe are, its tendency to perſonal happineſs, and the contrary tendency of vice. "Perſonal happineſs ariſes, either from the ſtate of a man's own mind, or from the ſtate and diſpoſition of external cauſes towards him."

We ſhall firſt examine the "tendency of virtue to happineſs with reſpect to the ſtate of a man's own mind."—This is a point of the utmoſt conſequence in morals; becauſe, unleſs we can convince ourſelves, or ſhew to others, that, by doing our duty, or fulfilling our moral obligations, we conſult the greateſt ſatisfaction of our own mind, or our higheſt intereſt on the whole, it will raiſe ſtrong and often unſurmountable prejudices againſt the practice of virtue, eſpecially whenever there ariſes any appearance of oppoſition between our duty and our ſatisfaction or intereſt. To creatures ſo deſirous of happineſs and averſe to miſery as we are, and often ſo oddly ſituated amidſt contending paſſions and intereſts, it is neceſſary that virtue appear not only an honourable, but a pleaſing and beneficent form. And in order to juſtify our choice to ourſelves, as well as before others, we muſt ourſelves feel, and be able to avow in the face of the whole world, that her ways are ways of pleaſantneſs, and her paths the paths of peace. This will ſhew, beyond all contradiction, that we not only approve, but can give a ſufficient reaſon for what we do.

Let a man in a cool hour, when he is diſengaged from buſineſs, and undiſturbed by paſſion, as ſuch cool hours will ſometimes happen, ſit down, and ſeriouſly reflect with himſelf what ſtate or temper of mind he would chuſe to feel and indulge, in order to be eaſy and to enjoy himſelf. Would he chuſe, for that purpoſe, to be in a conſtant diſſipation and hurry of thought; to be diſturbed in the exerciſe of his reaſon; to have various, and often interfering phantoms of good playing before his imagination, ſoliciting and diſtracting him by turns, now ſoothing him with

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with amuſing hopes, then torturing him with anxious fears; and to approve this minute what he ſhall condemn the next? Would he chuſe to have a ſtrong and painful ſenſe of every petty injury; quick apprehenſions of every impending evil; inceſſant and inſatiable deſires of power, wealth, honour, pleaſure; an irreconcileable antipathy againſt all competitors and rivals; inſolent and tyrannical diſpoſitions to all below him; fawning, and at the ſame time envious, diſpoſitions to all above him; with dark ſuſpicions and jealouſies of every mortal? Would he chuſe neither to love, nor to be beloved of any; to have no friend in whom to confide, or with whom to interchange his ſentiments or deſigns; no favourite, on whom to beſtow his kindneſs, or vent his paſſions; in fine, to be conſcious of no merit with mankind, no eſteem from any creature, no good affection to his Maker, no concerns for or hopes of his approbation; but, inſtead of all theſe, to hate, and know that he is hated, to contemn, and know that he is contemned by all; by the good becauſe he is ſo unlike, and by the bad becauſe he is ſo like themſelves; to hate or to dread the very Being that made him; and, in ſhort, to have his breaſt the ſeat of pride and paſſion, petulance and revenge, deep melancholy, cool malignity, and all the other furies that ever poſſeſſed and tortured mankind?—Would our calm inquirer after happineſs pitch on ſuch a ſtate, and ſuch a temper of mind, as the moſt likely means to put him in poſſeſſion of his deſired eaſe and ſelf-enjoyment?

Or would he rather chuſe a ſerene and eaſy flow of thought; a reaſon clear and compoſed; a judgment unbiaſſed by prejudice, and undiſtracted by paſſion; a ſober and well-governed fancy, which preſents the images of things true and unmixed with deluſive and unnatural charms, and therefore adminiſters no improper or dangerous fuel to the paſſions, but leaves the mind free to chuſe or reject, as becomes a reaſonable creature; a ſweet and ſedate temper, not eaſily ruffled by hopes or fears, prone neither to ſuſpicion nor revenge, apt to view men and things in the faireſt lights, and to bend gently to the humours of others rather than obſtinately to contend with them? Would he chuſe ſuch moderation and continence of mind, as neither to be ambitious of power, fond of honours, covetous of wealth, nor a ſlave to pleaſure; a mind of courſe neither elated with ſucceſs, nor dejected with diſappointment; ſuch a modeſt and noble ſpirit as ſupports power without inſolence, wears honours without pride, uſes wealth without profuſion or parſimony; and rejoices more in giving than in receiving pleaſure; ſuch fortitude and equanimity as riſes above misfortunes, or turns them into bleſſings; ſuch integrity and greatneſs of mind, as neither flatters the vices, nor triumphs over the follies of men; as equally ſpurns ſervitude and tyranny, and will neither engage in low deſigns, nor abet them in others? Would he chuſe, in fine, ſuch mildneſs and benignity of heart as takes part in all the joys, and refuſes none of the ſorrows of others; ſtands well affected to all mankind; is conſcious of meriting the eſteem of all, and of being beloved by the beſt; a mind which delights in doing good without any ſhew, and yet arrogates nothing on that account; rejoices in loving and being beloved by its Maker, acts ever under his eye, reſigns itſelf to his providence, and triumphs in his approbation? Which of theſe diſpoſitions would be his choice, in order to be contented, ſerene, and happy?—The former temper is *vice*, the latter *virtue*. Where one prevails, there miſery prevails, and by the generality is acknowledged to prevail. Where the other reigns, there happineſs reigns, and by the confeſſion of mankind is acknowledged to reign. The perfection of either temper is miſery, or happineſs, in perfection. Therefore every approach to either extreme, is an approach to miſery, or to happineſs; that is to ſay, every degree of vice or virtue is accompanied with a proportionable degree of miſery or happineſs.

The principal alleviations of a virtuous man's calamities are theſe:—that, though ſome of them may have been the effect of his imprudence, or weakneſs; yet few of them are ſharpened by a ſenſe of guilt, and none of them by a conſciouſneſs of wickedneſs, which ſurely is their keeneſt ſting:—that they are common to him with the beſt of men:—that they ſeldom or never attack him quite unprepared, but rather guarded with a conſciouſneſs of his own ſincerity and virtue, with a faith and truſt in providence, and a firm reſignation to its perfect orders:—that they may be improved as means of correction, or materials to give ſcope and ſtability to his virtues:—and, to name no more, they are conſiderably leſſened, and often ſweetened to him, by the general ſympathy of the wiſe and good.

His enjoyments are more numerous, or, if leſs numerous, yet more intenſe, than thoſe of bad men: for he ſhares in the joys of others by rebound; and every increaſe of general or particular happineſs is a real addition to his own. It is true, his friendly ſympathy with others ſubjects him to ſome pains which the hard-hearted wretch does not feel; yet to give a looſe to it, is a kind of agreeable diſcharge. It is ſuch a ſorrow as he loves to indulge; a ſort of pleaſing anguiſh, that ſweetly melts the mind, and terminates in a ſelf-approving joy. Tho' the good man may want means to execute, or be diſappointed in the ſucceſs of his benevolent purpoſes; yet he is ſtill conſcious of good affections; and that conſciouſneſs is an enjoyment of a more delightful ſavour than the greateſt triumphs of ſucceſsful vice. If the ambitious, covetous, or voluptuous, are diſappointed, their paſſions recoil upon them with a fury proportioned to their opinion of the value of what they purſue, and their hope of ſucceſs; while they have nothing within to balance the diſappointment, unleſs it is an uſeful fund of pride, which however frequently turns mere accidents into mortifying affronts, and exalts grief into rage and frenzy. Whereas the meek, humble, and benevolent temper is its own immediate reward; is ſatisfied from within; and as it magnifies greatly the pleaſure of ſucceſs, ſo it wonderfully alleviates, and in a manner annihilates, all pain for the want of it.

As the good man is conſcious of loving and wiſhing well to all mankind, he muſt be ſenſible of his deſerving the eſteem and goodwill of all; and this ſuppoſed reciprocation of ſocial feelings, is, by the very frame of our nature, made a ſource of very intenſe and enlivening joys. By this ſympathy of affections and intereſts he feels himſelf intimately united with the human race; and

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being ſenſibly alive over the whole ſyſtem, his heart receives and becomes reſponſive to every touch given to any part. So that he gathers contentment and delight from the pleaſed and happy ſtate of thoſe around him, from accounts and relations of ſuch happineſſes, from the very countenances, geſtures, voices, and ſounds even of creatures foreign to our kind, whoſe ſigns of joy and contentment he can any way diſcern.

Nor do thoſe generous affections ſtop any other natural ſource of joy whatever, or deaden his ſenſe of any innocent gratification. They rather keep the ſeveral ſenſes and powers of enjoyment open and diſengaged, intenſe, and uncorrupted by riot or abuſe; as is evident to any one who conſiders the diſſipated unfeeling ſtate of men of pleaſure, ambition, or intereſt, and compares it with the ſerene and gentle ſtate of a mind at peace with itſelf, and friendly to all mankind, unruffled by any violent emotion, and ſenſible to every good-natured and alluring joy.

It were eaſy, by going through the different ſets of affections, to ſhew, that it is only by maintaining the proportion ſettled there that the mind arrives at true repoſe and ſatisfaction. If fear exceeds that proportion, it ſinks into melancholy and dejection. If anger paſſes juſt bounds, it ferments into rage and revenge, or ſubſides into a ſullen corroding gloom, which embitters every good, and renders one exquiſitely ſenſible to every ill. The private paſſions, the love of honour eſpecially, whoſe impulſes are more generous as its effects are more diffuſive, are inſtruments of private pleaſure; but if they are diſproportioned to our wants, or to the value of the ſeveral objects, or to the balance of other paſſions equally neceſſary and more amiable, they become inſtruments of intenſe pain and miſery. For, being now deſtitute of that counterpoiſe which held them at a due pitch, they grow turbulent, peeviſh, and revengeful, the cauſe of conſtant reſtleſſneſs and torment, ſometimes flying out into a wild delirious joy, at other times ſettling into a deep ſplenetic grief. The concert between reaſon and paſſion is then broke: all is diſſonance and diſtraction within. The mind is out of frame, and feels an agony proportioned to the violence of the reigning paſſion.

The caſe is much the ſame, or rather worſe, when any of the particular kind affections are out of their natural order and proportion; as happens in the caſe of effeminate pity, exorbitant love, parental dotage, or any party paſſion, where the juſt regards to ſociety are ſupplanted. The more ſocial and diſintereſted the paſſion is, it breaks out into the wilder exceſſes, and makes the more dreadful havock, both within and abroad, as is but too apparent in thoſe caſes where a falſe ſpecies of religion, honour, zeal, or party-rage, has ſeized on the natural enthuſiaſm of the mind, and worked it up to madneſs. It breaks through all ties natural and civil, counteracts the moſt ſacred and ſolemn obligations, ſilences every other affection whether public or private, and transforms the moſt gentle natures into the moſt ſavage and inhuman.

Whereas the man who keeps the balance of affection even, is eaſy and ſerene in his motions; mild, and yet affectionate; uniform and conſiſtent with himſelf; is not liable to diſagreeable colliſions of intereſts and paſſions; gives always place to the moſt friendly and humane affections; and never to diſpoſitions or acts of reſentment, but on high occaſions, when the ſecurity of the private, or welfare of the public ſyſtem, or the great intereſts of mankind neceſſarily require a noble indignation; and even then he obſerves a juſt meaſure in wrath; and laſt of all, he proportions every paſſion to the value of the object he affects, or to the importance of the end he purſues.

To ſum up this part of the argument, the honeſt and good man has eminently the advantage of the knaviſh and ſelfiſh wretch in every reſpect. The pleaſures which the laſt enjoys flow chiefly from external advantages and gratifications; are ſuperficial and tranſitory; daſhed with long intervals of ſatiety, and frequent returns of remorſe and fear; dependent on favourable accidents and conjunctures; and ſubjected to the humours of men. But the good man is ſatisfied from himſelf; his principal poſſeſſions lie within, and therefore beyond the reach of the caprice of men or fortune; his enjoyments are exquiſite and permanent; accompanied with no inward checks to damp them, and always with ideas of dignity and ſelf-approbation; may be taſted at any time, and in any place. The gratifications of vice are turbulent and unnatural, generally ariſing from the relief of paſſions in themſelves intolerable, and iſſuing in tormenting reflections; often irritated by diſappointment, always inflamed by enjoyment, and yet ever cloyed with repetition. The pleaſures of virtue are calm and natural; flowing from the exerciſe of kind affections, or delightful reflections in conſequence of them; not only agreeable in the proſpect, but in the preſent feeling? they never ſatiate, or loſe their reliſh; nay, rather the admiration of virtue grows ſtronger every day; and not only is the deſire but the enjoyment heightened by every new gratification; and, unlike to moſt others, it is increaſed, not diminiſhed, by ſympathy and communication. In fine, the ſatisfactions of virtue may be purchaſed without a bribe, and poſſeſſed in the humbleſt as well as the moſt triumphant fortune; they can bear the ſtricteſt review, do not change with circumſtances, nor grow old with time. Force cannot rob, nor fraud cheat us of them; and, to crown all, inſtead of abating, they enhance every other pleaſure.

But the happy conſequences of virtue are ſeen, not only in the internal enjoyments it affords a man, but "in the favourable diſpoſition of external cauſes towards him, to which it contributes."

As virtue gives the ſober poſſeſſion of one's ſelf and the command of one's paſſions, the conſequence muſt be, heart's eaſe, and a fine natural flow of ſpirits, which conduce more than any thing elſe to health and long life. Violent paſſions, and the exceſſes they occaſion, gradually impair and wear down the machine. But the calm placid ſtate of a temperate mind, and the healthful exerciſes in which virtue engages her faithful votaries, preſerve the natural functions in full vigour and harmony, and exhilarate the ſpirits, which are the chief inſtruments of action.

It may by ſome be thought odd to aſſert, that virtue is no enemy to a man's fortune in the preſent ſtate of things.

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things.—But if, by fortune, be meant a moderate or competent ſhare of wealth, power, or credit, not overgrown degrees of them, what ſhould hinder the virtuous man from obtaining that? He cannot cringe or fawn, it is true; but he can be civil and obliging as well as the knave: and ſurely, his civility is more alluring, becauſe it has more manlineſs and grace in it than the mean adulation of the other: he cannot cheat or undermine; but he may be cautious, provident, watchful of occaſions, and equally prompt with the rogue in improving them: he ſcorns to proſtitute himſelf as a pander to the paſſions, or as a tool to the vices of mankind; but he may have as ſound an underſtanding, and as good capacities for promoting their real intereſts, as the vrieſt court-ſlave; and then, he is more faithful and true to thoſe who employ him. In the common courſe of buſineſs, he has the ſame chances with the knave of acquiring a fortune, and riſing in the world. He may have equal abilities, equal induſtry, equal attention to buſineſs; and in other reſpects he has greatly the advantage of him. People love better to deal with him; they can truſt him more; they know he will not impoſe on them, nor take advantage of them, and can depend more on his word than on the oath or ſtrongeſt ſecurities of others. Whereas what is commonly called cunning, which is the offspring of ignorance, and conſtant companion of knavery, is not only a mean-ſpirited, but a very ſhort-ſighted talent, and a fundamental obſtacle in the road of buſineſs. It may procure indeed immediate and petty gains; but it is attended with dreadful abatements, which do more than over-balance them, both as it ſinks a man's credit when diſcovered, and cramps that largeneſs of mind, which extends to the remoteſt as well as the neareſt intereſt, and takes in the moſt durable equally with the moſt tranſient gains. It is therefore eaſy to ſee how much a man's credit and reputation, and conſequently his ſucceſs, depend on his honeſty and virtue.

With regard to ſecurity and peace with his neighbours, it may be thought, perhaps, that the man of a quiet forgiving temper, and a flowing benevolence and courteſy, is much expoſed to injury and affronts from every proud or peeviſh mortal who has the power or will to do miſchief. If we ſuppoſe, indeed, this quietneſs and gentleneſs of nature accompanied with cowardice or puſillanimity, this may often be the caſe; but in reality, the good man is bold as a lion, and ſo much the bolder for being the calmer. Such a perſon will hardly be a butt to mankind. The ill-natured will be afraid to provoke him, and the good-natured will not incline to do it. Beſides, true virtue, which is conducted by reaſon, and exerted gracefully and without parade, is a moſt inſinuating and commanding thing; if it cannot diſarm malice and reſentment at once, it will wear them out by degrees, and ſubdue them at length. How many have, by favours, and prudently yielding, triumphed over an enemy who would have been inflamed into tenfold rage by the fierceſt oppoſition? In fine, goodneſs is the moſt univerſally popular thing that can be.

To conclude, the good man may have ſome enemies, but he will have more friends; and having given ſo many marks of private friendſhip or public virtue, he can hardly be deſtitute of a patron to protect, or a ſanctuary to entertain him, or to entertain or protect his children when he is gone. Though he ſhould have little elſe to leave them, he bequeaths them the faireſt, and generally the moſt unenvied, inheritance of a good name; which, like good ſeed ſown in the field of futurity, will often raiſe up unſolicited friends, and yield a benevolent harveſt of unexpected charities. But ſhould the fragrance of the parent's virtue prove offenſive to a perverſe or envious age, or even draw perſecution on the friendleſs orphans, there is One in heaven, who will be more than a father to them, and recompence their parent's virtues by ſhowering down bleſſings on them.

Motives to Virtue from the Being *and* Providence *of* God.

Besides the intereſting motive mentioned in the laſt ſection, there are two great motives to virtue, ſtrictly connected with human life, and reſulting from the very conſtitution of the human mind. The firſt is the being and providence of God; the ſecond is the immortality of the ſoul, with future rewards and puniſhments.

It appears from what has been ſaid, that man, by the conſtitution of his nature, is deſigned to be a religious creature. He is intimately connected with the Deity, and neceſſarily dependent on him. From that connection and neceſſary dependence reſult various obligations and duties; without fulfilling which, ſome of his ſublimeſt powers and affections would be incomplete and abortive. If he be likewiſe an immortal creature, and if his preſent conduct ſhall affect his future happineſs in another ſtate as well as in the preſent; it is evident, that we take only a partial view of the creature if we leave out this important property of his nature, and make a partial eſtimate of human life if we ſtrike out of the account, or over-look, that part of his duration which runs out into eternity.

It is evident, that "to have a reſpect to the Deity in our temper and conduct, to venerate and love his character, to adore his goodneſs, to depend upon and reſign ourſelves to his providence, to ſeek his approbation, and act under a ſenſe of his authority, is a fundamental part of moral virtue, and the completion of the higheſt deſtination of our nature."

But as piety is an eſſential part of virtue, ſo likewiſe it is a great ſupport and enforcement to the practice of it. To contemplate and admire a being of ſuch tranſcendent dignity and perfection as God, muſt naturally and neceſſarily open and enlarge the mind, give a freedom and ampleneſs to its powers, and a grandeur and elevation to its aims. For, "the greatneſs of an object, and the excellency of the act of any agent about a tranſcendant object, doth mightily tend to the enlargement and improvement of his faculties." Little objects, mean company, mean cares, and mean buſineſs, cramp the mind, contract its views, and give it a creeping air and deportment. But when it ſoars above mortal cares and mortal purſuits into the regions of divinity, and converſes with the Greateſt and Beſt of Beings, it ſpreads itſelf into a wider compaſs, takes higher flights in reaſon and goodneſs, and becomes Godlike in its air and manners. Virtue is, if one may ſay ſo, both the effect and cauſe of largeneſs of mind. It

requires

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requires that one think freely, and act nobly. Now, what can conduce more to freedom of thought and dignity of action, than to conceive worthily of God, to reverence and adore his unrivalled excellency, to imitate and transcribe that excellency into our own nature, to remember our relation to him, and that we are the image and representatives of his glory to the reſt of the creation? Such feelings and exerciſes muſt and will make us ſcorn all actions that are baſe, unhandſome, or unworthy our ſtate; and the relation we ſtand in to God will irradiate the mind with the light of wiſdom, and ennoble it with the liberty and dominion of virtue.

The influence and efficacy of religion may be conſidered in another light. We all know that the preſence of a friend, a neighbour, or any number of ſpectators, but eſpecially an auguſt aſſembly of them, uſes to be a conſiderable check upon the coduct of one who is not loſt to all ſenſe of honour and ſhame, and contributes to reſtrain many irregular ſallies of paſſion. In the ſame manner we may imagine, that the awe of ſome Superior Mind, who is ſuppoſed privy to our ſecret conduct, and armed with full power to reward or puniſh it, will impoſe a reſtraint on us in ſuch actions as fall not under the controul or animadverſion of others. If we go ſtill higher, and ſuppoſe our inmoſt thoughts and darkeſt deſigns, as well as our moſt ſecret actions, to lie open to the notice of the Supreme and Univerſal Mind, who is both the ſpectator and judge of human actions; it is evident, that the belief of ſo auguſt a preſence, and ſuch awful inſpection, muſt carry a reſtraint and weight with it proportioned to the ſtrength of that belief, and be an additional motive to the practice of many duties which would not have been performed without it.

It may be obſerved farther, that "to live under an habitual ſenſe of the Deity and his great adminiſtration, is to be converſant with wiſdom, order, and beauty, in the higheſt ſubjects, and to receive the delightful reflections and benign feelings which theſe excite, while they irradiate upon him from every ſcene of nature and providence." How improving muſt ſuch views be to the mind, in dilating and exalting it above thoſe puny intereſts and competitions which agitate and enflame the bulk of mankind againſt each other!—

Motive to Virtue from the Immortality of the Soul, &c.

The other motive mentioned was the immortality of the ſoul, with future rewards and puniſhments. The metaphyſical proofs of the ſoul's immortality, are commonly drawn—from its ſimple, uncompounded, and indiviſible nature; from whence it is concluded, that it cannot be corrupted or extinguiſhed by a diſſolution or deſtruction of parts:—from its having a beginning of motion within itſelf; whence it is inferred, that it cannot diſcontinue and loſe its motion:—from the different properties of matter and mind; the ſluggiſhneſs and inactivity of one, and the immenſe activity of the other; its prodigious flight of thought and imagination; its penetration, memory, foreſight, and anticipations of futurity; from whence it is concluded, that a being of ſo divine a nature cannot be extinguiſhed. But as theſe metaphyſical proofs depend on intricate reaſonings concerning the nature, properties, and diſtinction of body and mind, with which we are not very well acquainted, they are not obvious to ordinary underſtandings, and are ſeldom ſo convincing, even to thoſe of higher reach, as not to leave ſome doubts behind them. Therefore, perhaps, it is not ſo ſafe to reſt the proof of ſuch an important article on what many may call the ſubtleties of ſchool learning. Thoſe proofs which are brought from analogy, from the moral conſtitution and phenomena of the human mind, the moral attributes of God, and the preſent courſe of things, and which are therefore called the moral arguments, are the plaineſt, and generally the moſt ſatisfying. We ſhall ſelect only one or two from the reſt.

In tracing the nature and deſtination of any being, we form the ſureſt judgment from his powers of action, and the ſcope and limits of theſe, compared with his ſtate, or with that field in which they are exerciſed. If this being paſſes through different ſtates or fields of action, and we find a ſucceſſion of powers adapted to the different periods of his progreſs, we conclude that he was deſtined for thoſe ſucceſſive ſtates, and reckon his nature progreſſive. If, beſides the immediate ſet of powers which fit him for action in his preſent ſtate, we obſerve another ſet which appears ſuperfluous if he was to be confined to it, and which point to another or higher one, we naturally conclude, that he is not deſigned to remain in his preſent ſtate, but to advance to that for which thoſe ſupernumerary powers are adapted. Thus we argue, that the inſect, which has wings forming or formed, and all the apparatus proper for flight, is not deſtined always to creep on the ground, or to continue in the torpid ſtate of adhering to a wall, but is deſigned in its ſeaſon to take its flight in air. Without this farther deſtination, the admirable mechaniſm of wings, and the other apparatus, would be uſeleſs and abſurd. The ſame kind of reaſoning may be applied to man, while he lives only a ſort of vegetative life in the womb. He is furniſhed even there with a beautiful apparatus of organs, eyes, ears, and other delicate ſenſes, which receive nouriſhment indeed, but are in a manner folded up, and have no proper exerciſe or uſe in their preſent confinement. Let us ſuppoſe ſome intelligent ſpectator, who never had any connection with man, nor the leaſt acquaintance with human affairs, to ſee this odd phenomenon; a creature formed after ſuch a manner, and placed in a ſituation apparently unſuitable to ſuch various machinery; muſt he not be ſtrangely puzzled about the uſe of his complicated ſtructure, and reckon ſuch a profuſion of art and admirable workmanſhip loſt on the ſubject; or reaſon, by way of anticipation, that a creature, endued with ſuch various yet unexerted capacities, was deſtined for a more enlarged ſphere of action, in which thoſe latent capacities ſhall have full play? The vaſt variety, and yet beautiful ſymmetry and proportions, of the ſeveral parts and organs with which the creature is endued, and their apt coheſion with, and dependence on, the curious receptacle of their life and nouriſhment, would forbid his concluding the whole to be the birth of chance, or the bungling effort of an unſkilful artiſt, at leaſt would make him demur a while at ſo harſh a ſentence. But if, while he is in this ſtate of uncertainty, we ſuppoſe him to ſee the babe, after a few ſucceſsful ſtruggles,

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ſtruggles, throwing off his fetters, breaking looſe from his little dark priſon, and emerging into open day; then unfolding his recluſe and dormant powers, breathing in air, gazing at light, admitting colours, ſounds, and all the fair variety of nature; immediately his doubts clear up, the propriety and excellency of the workmanſhip dawn upon him with full luſtre, and the whole myſtery of the firſt period is unravelled by the opening of this new ſcene. Though in this ſecond period the creature lives chiefly a kind of animal life, *i. e.* of ſenſe and appetite; yet by various trials and obſervations he gains experience, and by the gradual evolution of the powers of imagination he ripens apace for an higher life, for exerciſing the arts of deſign and imitation, and of thoſe in which ſtrength or dexterity are more requiſite than acuteneſs or reach of judgment. In the ſucceeding rational or intellectual period, his underſtanding, which formerly crept in a lower, mounts into an higher ſphere, canvaſſes the natures, judges of the relations of things, forms ſchemes, deduces conſequences from what is paſt, and from preſent as well as paſt collects future events. By this ſucceſſion of ſtates, and of correſpondent culture, he grows up at length into a moral, ſocial, and a political creature. This is the laſt period, at which we perceive him to arrive in this his mortal career. Each period is introductory to the next ſucceeding one; each life is a field of exerciſe and improvement for the next higher one, the life of the fœtus for that of the infant, the life of the infant for that of the child, and all the lower for the higheſt and beſt.—But is this the laſt period of nature's progreſſion? Is this the utmoſt extent of her plot, where ſhe winds up the drama, and diſmiſſes the actor into eternal oblivion! Or does he appear to be inveſted with ſupernumerary powers, which have not full exerciſe and ſcope, even in the laſt ſcene, and reach not that maturity or perfection of which they are capable; and therefore point to ſome higher ſcene, where he is to ſuſtain another and more important character than he has yet ſuſtained? If any ſuch there are, may we not conclude by analogy, or in the ſame way of anticipation as before, that he is deſtined for that afterpart, and is to be produced upon a more auguſt and ſolemn ſtage, where his ſublimer powers ſhall have proportioned action, and its nature attain its completion?

If we attend to that curioſity, or prodigious thirſt of knowledge, which is natural to the mind in every period of its progreſs; and conſider withal the endleſs round of buſineſs and care, and the various hardſhips to which the bulk of mankind are chained down; it is evident, that in this preſent ſtate, it is impoſſible to expect the gratification of an appetite at once ſo inſatiable and ſo noble. Our ſenſes, the ordinary organs by which knowledge is let into the mind, are always imperfect, and often fallacious; the advantages of aſſiſting, or correcting them, are poſſeſſed by few; the difficulties of finding out truth amidſt the various and contradictory opinions, intereſts, and paſſions of mankind, are many; and the wants of the creature, and of thoſe with whom he is connected, numerous and urgent; ſo that it may be ſaid of moſt men, that their intellectual organs are as much ſhut up and ſecluded from proper nouriſhment and exerciſe in that little circle to which they are confined, as the bodily organs are in the womb. Nay, thoſe who to an aſpiring genius have added all the aſſiſtances of art, leiſure, and the moſt liberal education, what narrow proſpects can even they take of this unbounded ſcene of things from that little eminence on which they ſtand? And how eagerly do they ſtill graſp at new diſcoveries, without any ſatisfaction or limit to their ambition?

But ſhould it be ſaid, that man is made for action, and not for ſpeculation, or fruitleſs ſearches after knowledge; we aſk, For what kind of action? Is it only for bodily exerciſes; or for moral, political, and religious ones? Of all theſe he is capable: yet, by the unavoidable circumſtances of his lot, he is tied down to the former; and has hardly any leiſure to think of the latter; or, if he has, wants the proper inſtruments of exerting them. The love of virtue, of one's friends and country, the generous ſympathy with mankind, and heroic zeal of doing good, which are all ſo natural to great and good minds, and ſome traces of which are found in the loweſt, are ſeldom united with proportioned means or opportunities of exerciſing them; ſo that the moral ſpring, the noble energies and impulſes of the mind, can hardly find proper ſcope, even in the moſt fortunate condition; but are much depreſſed in ſome, and almoſt entirely reſtrained in the generality, by the numerous clogs of an indigent, ſickly, or embaraſſed life. Were ſuch mighty powers, ſuch Godlike affections planted in the human breaſt, to be folded up in the narrow womb of our preſent exiſtence, never to be produced into a more perfect life, nor to expatiate in the ample career of immortality?

Let it be conſidered, at the ſame time, that no poſſeſſion, no enjoyment within the round of mortal things, is commenſurate to the deſires, or adequate to the capacities of the mind. The moſt envied condition has its abatements; the happieſt conjuncture of fortune leaves many wiſhes behind; and after the higheſt gratifications, the mind is carried forward in purſuit of new ones without end. Add to all, the fond deſire of immortality, the ſecret dread of non-exiſtence, and the high unremitting pulſe of the ſoul beating for perfection, joined to the improbability or the impoſſibility of attaining it here; and then judge whether this elaborate ſtructure, this magnificient apparatus of inward powers and organs, does not plainly point out an hereafter, and intimate eternity to man? Does nature give the finiſhing touches to the leſſer and ignobler inſtances of her ſkill, and raiſe every other creature to the maturity and perfection of his being; and ſhall ſhe leave her principal workmanſhip unfiniſhed? Does ſhe carry the vegetative and animal life in man to their full vigour, and higheſt deſtination; and ſhall ſhe ſuffer his intellectual, his moral, his divine life to fade away, and be for ever extinguiſhed? Would ſuch abortions in the moral world be congruous to that perfection of wiſdom and goodneſs which upholds and adorns the natural?

We muſt therefore conclude, from this detail, that the preſent ſtate, even at its beſt, is only the womb of man's being, in which the nobleſt principles of his nature are in a manner fettered or ſecluded from a correſpondent ſphere of action; and therefore deſtined for a future and unbounded ſtate, where they ſhall emancipate themſelves,

and exert the fulneſs of their ſtrength. The moſt accompliſhed mortal, in this low and dark appartment of nature, is only the rudiments of what he ſhall be, when he takes his etherial flight, and puts on immortality. Without a reference to that ſtate, man were a mere abortion, a rude unfiniſhed embryo, a monſter in nature. But this being once ſupooſed, he ſtill maintains his rank, of the maſter-piece of the creation; his latent powers are all ſuitable to the harmony and progreſſion of nature; his noble aſpirations, and the pains of his diſſolution, are his efforts towards a ſecond birth, the pangs of his delivery into light, liberty, and perfection; and death his diſcharge from gaol, his ſeparation from his fellow-priſoners, and introduction into the aſſembly of thoſe heroic ſpirits who are gone before him, and of their great eternal Parent. The fetters of his mortal coil being looſened, and his priſon-walls broke down, he will be bare and open on every ſide to the admiſſion of truth and virtue, and their fair attendant happineſs; every vital and intellectual ſpring will evolve itſelf, with a divine elaſticity, in the free air of heaven. He will not then peep at the univerſe and its glorious Author through a dark grate, or a groſs medium, nor receive the reflections of his glory through the ſtrait openings of ſenſible organs; but will be all eye, all ear, all etherial and divine feeling.—Let one part, however, of the analogy be attended to; That, as in the womb we receive our original conſtitution, form, and the eſſential ſtamina of our being, which we carry along with us into the light, and which greatly affect the ſucceeding periods of our life; ſo our temper and condition in the future life will depend on the conduct we have obſerved, and the character we have formed in the preſent life. We are here in miniature what we ſhall be at full length hereafter. The firſt rude ſketch, or out-lines of reaſon and virtue, muſt be drawn at preſent, to be afterwards enlarged to the ſtature and beauty of angels.

This, if duly attended to, muſt prove not only a guard, but an admirable incentive to virtue. For he who faithfully and ardently follows the light of knowledge, and pants after higher improvements in virtue, will be wonderfully animated and inflamed in that purſuit, by a full conviction that the ſcene does not cloſe with life;—that his ſtruggles ariſing from the weakneſs of nature, and the ſtrength of habit, will be turned into triumphs;—that his career in the tracts of wiſdom and goodneſs will be both ſwifter and ſmoother;—and thoſe generous ardors with which he glows towards heaven, *i. e.* the perfection and immortality of virtue, will find their adequate object and exerciſe in a ſphere proportionably enlarged, incorruptible, immortal. On the other hand, what an inexpreſſible damp muſt it be to the good man, to dread the total extinction of that light and virtue, without which life, nay immortality itſelf, were not worth a ſingle wiſh?

Many writers draw their proofs of the immortality of the ſoul, and of a future ſtate of rewards and puniſhments, from the unequal diſtribution of theſe here. It cannot be diſſembled that wicked men often eſcape the outward puniſhment due to their crimes, and do not feel the inward in that meaſure their demerit ſeems to require, partly from the callouſneſs induced upon their nature by the habits of vice, and partly from the diſſipation of their minds abroad by pleaſure or buſineſs; and ſometimes good men do not reap all the natural and genuine fruits of their virtue, through the many unforſeen or unavoidable calamities in which they are involved. This, no doubt, upon the ſuppoſition of an all-wiſe and good Providence, were an argument, and a ſtrong one too, for a future ſtate, in which thoſe inequalities ſhall be corrected. But unleſs we ſuppoſe a prepollent good order in the preſent ſcene of things, we weaken the proof of the divine adminiſtration, and the preſumption of better order in any future period of it.

Virtue has preſent rewards, and vice preſent puniſhments, annexed to it; ſuch rewards and puniſhments as make virtue, in moſt caſes that happen, far more eligible than vice: but, in the infinite variety of human contingencies, it may ſometimes fall out, that the inflexible practice of virtue ſhall deprive a man of conſiderable advantages to himſelf, his family, or friends, which he might gain by a well-timed piece of roguery, ſuppoſe by betraying his truſt, voting againſt his conſcience, ſelling his country, or any other crime where the ſecurity againſt diſcovery ſhall heighten the temptation. Or, it may happen, that a ſtrict adherence to his honour, to his religion, to the cauſe of liberty and virtue, ſhall expoſe him, or his family, to the loſs of every thing, nay to poverty, ſlavery, death itſelf, or to torments far more intolerable. Now, what ſhall ſecure a man's virtue in circumſtances of ſuch trial? What ſhall enforce the obligations of conſcience againſt the allurements of ſo many intereſts, the dread of ſo many and ſo terrible evils, and the almoſt unſurmountable averſion of human nature to exceſſive pain? The conflict is the greater, when the circumſtances of the crime are ſuch as eaſily admit a variety of alleviations from neceſſity, natural affection, love to one's family, or friends, perhaps in indigence: Theſe will give it even the air of virtue. Add to all, that the crime may be thought to have few bad conſequences,—may be eaſily concealed,—or imagined poſſible to be retrieved in a good meaſure by future good conduct. It is obvious to which ſide moſt men will lean in ſuch a caſe, and how much need there is of a balance in the oppoſite ſcale, from the conſideration of a God, of a proviſence, and of an immortal ſtate of retribution, to keep the mind firm and uncorrupt in thoſe or like inſtances of ſingular trial or diſtreſs.

But without ſuppoſing ſuch peculiar inſtances, a ſenſe of a Governing Mind, and a perſuaſion that virtue is not only befriended by him here, but will be crowned by him hereafter with rewards ſuitable to its nature, vaſt in themſelves, and immortal in their duration, muſt be not only a mighty ſupport and incentive to the practice of virtue, but a ſtrong barrier againſt vice. The thoughts of an almighty Judge, and of an impartial future reckoning, are often alarming, inexpreſſibly ſo, even to the ſtouteſt offenders. On the other hand, how ſupporting muſt it be to the good man, to think that he acts under the eye of his Friend, as well as Judge! How improving, to conſider the preſent ſtate as connected with a future one, and every relation in which he ſtands as a ſchool of dicipline for his affections, every trial as the exerciſe of ſome virtue, and the virtuous deeds which reſult from both as introductoty to higher ſcenes of action and enjoyment! Finally, how tranſporting

tranſporting is it to view death as his diſcharge from the warfare of mortality, and a triumphant entry into a ſtate of freedom, ſecurity, and perfection; in which knowledge and wiſdom ſhall break upon him from every quarter; where each faculty ſhall have its proper object; and his virtue, which was often damped or defeated here, ſhall be enthroned in undiſturbed and eternal empire!

On reviewing this ſhort ſyſtem of morals, and the motives which ſupport and enforce it, and comparing both with the Chriſtian ſcheme, what light, and vigour do they borrow from thence! How clearly and fully does Chriſtianity lay open the connections of our nature, both material and immaterial, and future as well as preſent! What an ample and beautiful detail does it preſent of the duties we owe to God, to ſociety, and ourſelves; promulgated in the moſt ſimple, intelligible, and popular manner; diveſted of every partiality of ſect or nation; and adapted to the general ſtate of mankind! With what bright and alluring examples does it illuſtrate and recommend the practice of thoſe duties; and with what mighty ſanctions does it inforce that practice! How ſtrongly does it deſcribe the corruptions of our nature; the deviations of our life, from the rule of duty; and the cauſes of both! How marvellous and benevolent a plan of redemption does it unfold, by which thoſe corruptions may be remedied, and our nature reſtored from its deviations, to tranſcendent heights of virtue and piety! Finally, what a fair and comprehenſive proſpect does it give us of the adminiſtration of God, of which it repreſents the preſent ſtate only as a ſmall period; and a period of warfare and trial! How ſolemn and unbounded are the ſcenes which it opens beyond it; the reſurrection of the dead; the general judgment; the equal diſtribution of rewards and puniſhments to the good and the bad; and the full completion of divine wiſdom and goodneſs in the final eſtabliſhment of order, perfection, and happineſs!—How glorious then is that ſcheme of religion, and how worthy of affection as well as of admiration, which, by making ſuch diſcoveries, and affording ſuch aſſiſtances, has diſcloſed the unfading fruits and triumphs of virtue, and ſecured its intereſts beyond the power of time and chance!

MOR

MORAL SENSE, that whereby we perceive what is good, virtuous, and beautiful in actions, manners, and characters. See MORALS.

MORALITY. See MORAL PHILOSOPHY.

MORASS, a low, moiſt land, which receives the waters from the higher grounds without having any deſcent to carry them off.

MORAVIA, a marquiſate, or province in Bohemia, bounded by Sileſia on the north-eaſt, by Hungary and Auſtria on the ſouth, and by Bohemia on the north-weſt.

MORAVIANS, a ſect of Proteſtants, who have been ſettled for a conſiderable time paſt at Hernhuth in Germany, and have of late years ſpread themſelves over moſt of our American colonies, as well as in ſeveral parts of England, where they are permitted to ſettle by a late act of parliament. They have a kind of church-government peculiar to themſelves, and are commonly known by the name of *Unitas Fratrum*, or *The Brethren*. They profeſs the utmoſt veneration for our bleſſed Saviour, whom they conſider as their immediate Head and Director; enjoin the moſt implicit obedience to the rulers of their church; and are ſaid to practiſe much brotherly love amongſt one another.

MORBID, among phyſicians, ſignifies diſeaſed or corrupt; a term applied either to an unſound conſtitution, or to thoſe parts or humours that are infected by a diſeaſe.

MORDELLA, in zoology, a genus of the coleoptera claſs of inſects. The antennæ are thread-ſhaped, and ſerrated; the head is deflected under the neck; the pappi are clavated, compreſſed, and obliquely blunted; and the elytra are bent backwards near the apex. There are ſix ſpecies, all natives of different parts of Europe.

MOREA, the ancient Peloponneſus, is a province of European Turky, and is a peninſula about one hundred and eighty miles long, and one hundred and thirty broad, bounded by the gulphs of Lepanto and Engia on the north; by the Egean ſea, or Archipelago, on the eaſt; and by the Mediterranean on the ſouth and weſt.

MORESK, or MORISCO, is a kind of painting, carving, *&c.* done after the manner of the Moors; conſiſting of ſeveral groteſque pieces and compartments, promiſcuouſly mingled, not containing any perfect figure of a man, or other animal; but a wild reſemblance of birds, beaſts, trees, *&c.*

MORGAY, in ichthyology. See SQUALUS.

MORINA, in botany, a genus of the diandria monogynia claſs. The corolla is unequal; the calix of the fruit conſiſts of one dentated leaf; the calix of the flower is bifid; and there is but one ſeed under the flower-calix. There is but one ſpecies, a native of Perſia.

MORINDA, in botany, a genus of the pentandria monogynia claſs. The flowers are aggregate and monopetalous; the ſtigma is bifid; and the drupæ are aggregate. There are three ſpecies, none of them natives of Britain.

MORINELLUS, in ornithology. See CHARADRIUS.

MORISONA, a genus of the polyandria monogynia claſs. The corolla conſiſts of four petals, and the calix of two ſegments; the berry is hard, and contains one ſeed. There is but one ſpecies, a native of America.

MORLAIX, a port-town of France, in the province of Britany: W. long. 4°, N. lat. 48° 37′.

MORMYLUS, in ichthyology. See SPARUS.

MORNING, the beginning of the day, the firſt appearance of light, or the time from midnight till noon.

MOROCCO, the capital of the kingdom of the ſame name in Africa: W. long. 9°, N. lat. 32°.

MOROCHTHUS, in natural hiſtory, an indurated clay, called by us French chalk; ſerving taylors and others to

to mark with. The ancients eſteemed it as an aſtringent, preſcribing it in the colic, hæmorrhages and other fluxes.

MORPETH, a borough-town of Northumberland, fourteen miles north of Newcaſtle, which ſends two members to parliament.

MORTALITY, or *Bills of* MORTALITY, properly denote weekly liſts of the perſons who die in any place. See ANNUITIES.

Brief of MORTANCESTRY, in Scots law; anciently the ground of an action at the inſtance of an heir, in the ſpecial caſe where he had been excluded from the poſſeſſion of his anceſtor's eſtate by the ſuperior or other perſon pretending right.

MORTAR, a preparation of lime and ſand mixed up with water, which ſerves as a cement, and is uſed by maſons and bricklayers in building of walls of ſtone and brick.

MORTAR-PIECE. See GUNNERY.

MORTGAGE, in law, a pledge or pawn of lands, tenements, *&c.* for money borrowed; ſo called, becauſe if the money is not paid at the day, the land dies to the debtor, and is forfeited to the creditor.

MORTIER, an enſign of dignity, borne by the chancellor and grand preſidents of the parliament of France. That borne by the chancellor, is a piece of cloth of gold, edged and turned up with ermine; and that of the firſt preſident is a piece of black velvet edged with a double row of gold lace, while that of the other preſidents is only edged with a ſingle row. This they formerly carried on their heads, as they do ſtill in grand ceremonies, ſuch as the entry of the king; but, ordinarily, they carry them in the hand.

MORTISE, or MORTOISE, in carpentry, *&c.* a kind of joint, wherein a hole of a certain depth is made in a piece of timber, which is to receive another piece called a tenon.

MORTMAIN, in law, is the alienation of lands or tenements to any religious houſe, corporation, or fraternity, and their ſucceſſors.

MORTUARY, in the eccleſiaſtical law, is a gift left by a man at his death to his pariſh church, in recompence of perſonal tithes omitted to be paid in his lifetime: or it is that beaſt, or other cattle, which, after the death of the owner, by the cuſtom of the place, is due to the parſon or vicar, in lieu of tithes or offerings forgot, or not well and truly paid by him that is dead.

MORUS, in botany, a genus of the monœcia tetrandria claſs. The calix of the male has four ſegments; it has no corolla: The calix of the female conſiſts of four leaves; it has no corolla; the ſtyli are two, and the berry contains one ſeed. There are ſeven ſpecies, none of them natives of Britain.

MOSAIC, or MOSAIC-WORK, an aſſemblage of little pieces of glaſs, marble, precious ſtones, *&c.* of various colours, cut ſquare, and cemented on a ground of ſtucco, in ſuch a manner as to imitate the colours and degradations of painting.

Method of performing MOSAIC-WORK of glaſs is this: They provide little pieces of glaſs, of as many different colours and ſizes as poſſible.

Now, in order to apply theſe ſeveral pieces, and out of them to form a picture, they in the firſt place procure a cartoon or deſign to be drawn; this is transferred to the ground or plaſter by calking, as in painting in freſco. See FRESCO.

As this plaſter is to be laid thick on the wall, and therefore will continue freſh and ſoft a conſiderable time, ſo that there may be enough prepared at once, to ſerve for as much work as will take up three or four days.

This plaſter is compoſed of lime, made of hard ſtone, with brick duſt very fine, gum tragacanth, and whites of eggs: when this plaſter has been thus prepared and laid on the wall, and made the deſign of what is to be repreſented, they take out the little pieces of glaſs with a pair of plyers, and range them one after another, ſtill keeping ſtrictly to the light, ſhadow, different taints and colours repreſented in the deſign before; preſſing or flatting them down with a ruler, which ſerves both to ſink them within the ground, and to render the ſurface even.

Thus in a long time, and with a great deal of labour, they finiſh the work, which is ſtill the more beautiful, as the pieces of glaſs are more uniform, and ranged at an even height.

Some of theſe pieces of moſaic-work are performed with that exactneſs, that they appear as ſmooth as a table of marble, and as finiſhed and maſterly as a painting in freſco; with this advantage, that they have a fine luſtre, and will laſt ages.

The fineſt works of this kind that have remained till our time, and thoſe by whom the moderns have retrieved the art, which was in a manner loſt, are thoſe in the church of St Agnes, formerly the temple of Bacchus at Rome; and ſome at Piſa, Florence, and other cities of Italy. The moſt eſteemed among the works of the moderns are thoſe of Joſeph Pine, and the chevalier Lanfranc in the church of St Peter at Rome: there are alſo very good ones at Venice.

Method of performing MOSAIC-WORK of marble and precious ſtones is this: The ground of moſaic-works, wholly marble, is uſually a maſſive marble, either white or black. On this ground the deſign is cut with a chiſſel, after it has been firſt calqued. After it has been cut of a conſiderable depth, *i. e.* an inch or more, the cavities are filled up with marble of a proper colour, firſt faſhioned according to the deſign, and reduced to the thickneſs of the indentures with various inſtruments. To make the pieces thus inſerted into the indentures cleave faſt, whoſe ſeveral colours are to imitate thoſe of the deſign, they uſe a ſtucco, compoſed of lime and marble duſt; or a kind of maſtic, which is prepared by each workman, after a different manner peculiar to himſelf.

The figures being marked out, the painter or ſculptor himſelf draws with a pencil the colours of the figures, not determined by the ground, and in the ſame manner makes ſtrokes or hatchings in the place, with

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where ſhadows are to be: and after he has engraven with the chiſſel all the ſtrokes thus drawn, he fills them up with a black maſtic, compoſed partly of burgundy-pitch poured on hot; taking off afterwards what is ſuperfluous with a piece of ſoft ſtone or brick, which, together with water and beaten cement, takes away the maſtic, poliſhes the marble, and renders the whole ſo even that one would imagine it only conſiſted of one piece.

This is the kind of moſaic-work that is ſeen in the pompous church of the invalids at Paris, and the fine chaple at Verſailles, with which ſome entire apartments of that palace are incruſtated.

As for moſaic-work of precious ſtones, other and finer inſtruments are required than thoſe uſed in marble; as drills, wheels, *&c.* uſed by lapidaries and engravers on ſtone. As none but the richeſt marbles and ſtones enter this work, to make them go the farther, they are ſawn into the thinneſt leaves imaginable, ſcarce exceeding half a line in thickneſs; the block to be ſawn is faſtened firmly with cords on the bench, and only raiſed a little on a piece of wood, one or two inches high. Two iron pins, which are on one ſide the block, and which ſerve to faſten it, are put into a vice contrived for the purpoſe; and with a kind of ſaw or bow, made of fine braſs-wire, bent on a piece of ſpongy wood, together with emery ſteeped in water, the leaf is gradually faſhioned by following the ſtroke of the deſign, made on paper, and glued on the piece. When there are pieces enough faſtened to form an entire flower, or ſome other part of the deſign, they are applied to the ground.

The ground which ſupports this moſaic-work is uſually of free-ſtone. The matter with which the ſtones are joined together, is a maſtic, or kind of ſtucco, laid very thin on the leaves as they are faſhioned; and this being done, the leaves are applied with plyers.

If any contour, or ſide of a leaf, be not either ſquared or rounded ſufficiently, ſo as to fit the place exactly, into which it is to be inſerted, when it is too large, it is to be brought down with a braſs-file or raſp; and if it be too little, it is managed with a drill and other inſtruments uſed by lapidaries.

Moſaic-work of marble is uſed in large works, as in pavements of churches, baſilics, and palaces; and in the incruſtation and vaneering of the walls of the ſame edifices.

As for that of precious ſtones, it is only uſed in ſmall works, as ornaments for altar-pieces, tables for rich cabinets, precious ſtones being ſo very dear.

Manner of performing MOSAIC-WORK *of gypſum.* Of this ſtone calcined in a kiln, and beaten in a mortar, and ſifted, the French workmen make a ſort of artificial marbles, imitating precious ſtones; and of theſe they compoſe a kind of moſaic-work, which does not come far ſhort either of the durableneſs or the vivacity of the natural ſtones; and wich beſides has this advantage, that it admits of continued pieces or paintings of entire compartiments without any viſible joining.

Some make the ground of plaſter of Paris, others of free ſtone. If it be of plaſter of Paris, they ſpread it in a wooden frame, of the length and breadth of the work intended, and in thickneſs about an inch and a half. This frame is ſo contrived, that the tenons being only joined to the mortiſes by ſingle pins, they may be taken aſunder, and the frame be diſmounted, when the plaſter is dry. The frame is covered on one ſide with a ſtrong linen cloth, nailed all round, which being placed horizontally with the linen at the bottom, is filled with plaſter paſſed through a wide ſieve. When the plaſter is half dry, the frame is ſet up perpendicularly, and left till it is quite dry; then it is taken out, by taking the frame to pieces.

In this moſaic, the ground is the moſt important part. Now in order to the preparation of this ſifted gypſum, which is to be applied on this ground, it is diſſolved and boiled in the beſt Engliſh glue, and mixed with the colour that it is to be of; then the whole is worked up together into the uſual conſiſtence of plaſter, and then is taken and ſpread on the ground five or ſix inches thick. If the work be ſuch, as that mouldings are required, they are formed with gouges and other inſtruments.

It is on this plaſter, thus coloured like marble or precious ſtone, and which is to ſerve as a ground to a work, either of lapis, agate, alabaſter, or the like, that the deſign to be repreſented is drawn; having been firſt pounced or calqued. To hollow or impreſs the deſign, they uſe the ſame inſtruments that ſculptors do; the ground whereon they are to work not being much leſs hard than the marble itſelf. The cavities being thus made in the ground, are filled with the ſame gypſum boiled in glue, only differently coloured, and thus are the different colours of the original repreſented. In order that the neceſſary colours and teints may be ready at hand, the quantities of the gypſum are tempered with the ſeveral colours in pots.

After the deſign has been thus filled and rendered viſible, by half-poliſhing it with brick and ſoft ſtone, they go over it again, cutting ſuch plates as are either to be weaker or more ſhadowed, and filling them with gypſum; which work they repeat, till all the colours being added one after the other, repreſent the original to the life.

When the work is finiſhed, they ſcour it with ſoft ſtone, ſand, and water; after that, with a pumice-ſtone; and in the laſt place poliſh it with a wooden mullet and emery. Then, laſtly, they give it a luſtre, by ſmearing it over with oil, and rubbing it a long time with the palm of the hand, which gives it a luſtre no ways inferior to that of natural marble.

MOSAMBIQUE, the capital of a province of the ſame name in Zanguebar, in Africa, ſituated on an iſland at the mouth of the river Moſambique: E. lon. 40°. S. lat. 15°.

MOSCHUS, a genus of quadrupeds of the order of pecora, having no horns; the canine teeth of the upper jaw are exerted. There are three ſpecies, *viz.* 1. The moſchiferus, or muſk animal, has a bag or pellicle near the navel, in which the perfume called muſk is contained.

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This creature, when full grown, is three feet in length, from the tip of the nose to the rump; the head is oblong, and the anterior part much like the greyhound; the ears are large and erect, they resemble those of the rabbit, and are equal in length to the diameter of the forehead; the tail is not more than two inches in length, and the creature always carries it erect; the body is tolerably fleshy, and rounded; the legs about a foot in length, and very robust; the feet deeply divided, each into two claws in the anterior part, and as many heels behind. The fur on the head and that on the legs is about half an inch long, that on the belly is an inch and a half, and that which grows on the back three inches; these hairs are thicker than in any other known animal, and are variegated, from the base to the extremity, with distinct spaces of brown and white. The vessel or bag in which the perfume called musk is contained, is three inches long and two broad, and hangs under the belly, protuberating near three quarters of an inch beyond the surface. It is a native of Tartary.—2. The grimmia has a protuberant belt upon its head, and is found in Africa. 3. The pygmæus has feet narrower than a man's finger. It is found in Asia and Guinea.

MOSCOW, the capital of the province of the same name in Muscovy, situated on the river Moscowa, 360 miles south-east of Peterſburg: E. long. 38°, N. lat. 55° 45′.

MOSCOWA, a river which rises in the west part of the province of Moscow, and falls into the river Ocka at Kolomna.

MOSELLE, a river of Germany, which rises in the mountains of Vauge, in Lorrain, and, running thro' that duchy and the electorate of Triers, falls into the Rhine at Coblentz.

MOSKITO, a country of North America, situated between 85° and 88° of west longitude, and between 13° and 15° of north latitude; having the north-sea on the north and east, Nicaragua on the south, and Honduras on the west.

MOSPURG, or Mosburg, a town of Germany, in the circle of Bavaria, situated at the confluence of the rivers Iser and Amburg, thirty miles north-east of Munich.

MOSQUE, a temple, or place of religious worship, among the Mahometans.

All mosques are square buildings, generally built with stone. Before the chief gate there is a square court, paved with white marble; and low galleries round it, whose roof is supported by marble pillars. In these galleries the Turks wash themselves before they go into the mosque. In each mosque there is a great number of lamps; and between these hang many crystal rings, ostriches eggs, and other curiosities, which when the lamps are lighted make a fine shew. As it is not lawful to enter the mosques with shoes or stockings on, the pavements are covered with pieces of stuff sewed together, each being wide enough to hold a row of men kneeling, sitting, or prostrate. The women are not allowed to enter the mosque, but stay in the porches without. About every mosque there are six high towers, called minarets, each of which has three little open galleries, one above another: these towers, as well as the mosques, are covered with lead, and adorned with gilding and other ornaments; and from thence, instead of a bell, the people are called to prayers by certain officers appointed for that purpose. Most of the mosques have a kind of hospital belonging to them, in which travellers, of what religion soever, are entertained during three days. Each mosque has also a place called Tarbe, which is the burying place of its founders; within which is a tomb six or seven feet long, covered with green velvet or sattin; at the ends of which are two tapers, and round it several seats for those who read the koran and pray for the souls of the deceased.

MOSS, in botany. See Muscus.

Moss is also a name given to boggy grounds in many parts of the kingdom. These consist of a turfy surface, below which is a black, moist, spongy earth, which being dug up with spades somewhat in the form of bricks, and dried, is what they call peats, used as fuel in several parts; and the upper scurf, being cut and dried, makes turfs, another coarser sort of fuel.

MOSTRA, in the Italian music, a mark at the end of a line or space, to shew that the first note of the next line is in that place: and if this note be accompanied with a sharp or flat, it is proper to place these characters along with the mostra.

MOTACILLA, in ornithology, a genus of birds, of the order of the passeres, distinguished by a straight beak, of a subulated figure, and a lacerated tongue. There are 49 species belonging to this genus, most of which feed upon insects, and migrate from the north to the southern countries in order to procure subsistence in winter.

MOTE, in law-books, signifies court or convention; as a ward-mote, burgh-mote, swain-mote, *&c.*

MOTH, in zoology. See Phalæna.

MOTHER, a term of relation, denoting a woman who hath born a child.

MOTION, is defined to be the continued and successive change of place. See Mechanics.

MOTTO, in armoury, a short sentence or phrase carried in a scroll, generally under, but sometimes over the arms; sometimes alluding to the bearing, sometimes to the name of the bearer, and sometimes containing whatever pleases the fancy of the deviser.

MOVEABLE, in general, denotes any thing capable of being moved.

Moveable *Subject*, in Scots law, any thing that moves itself, or can be moved; in contradistinction to immoveable or heretable subjects, as lands, houses, *&c.* See Law, Tit. ix. 2.

MOVEMENT, in mechanics, a machine that is moved by clock-work. See Watch.

Perpetual Movement. Some have attempted to find a perpetual movement, but without success; and there is reason to think, from the principles of mechanics, that such a movement is impossible: for though in many cases of bodies acting upon one another, there is a gain

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gain of abſolute motion; yet the gain is always equal in oppoſite directions, ſo that the quantity of direct motion is never increaſed.

To make a perpetual movement it appears neceſſary, that a certain ſyſtem of bodies, of a determined number and quantity, ſhould move in a certain ſpace for ever, and in a certain way and manner: and for this there muſt be a ſeries of actions returning in a circle, otherwiſe the movement will not be perpetual; ſo that any action by which the abſolute quantity of force is increaſed, of which there are ſeveral ſorts, muſt have its correſponding counter-action, by which the gain of force is deſtroyed, and the quantity of force reſtored to its firſt ſtate.

Thus, by theſe actions, there will never be any gain of direct force, to overcome the friction and the reſiſtance of the medium; ſo that every motion being diminiſhed by theſe reſiſtances, they muſt at length languiſh and ceaſe.

MOULD, or MOLD, in the mechanic arts, *&c.* a cavity cut with a deſign to give its form or impreſſion to ſome ſofter matter applied therein, of great uſe in ſculpture, foundery, *&c.*

MOULD, in agriculture, a looſe kind of earth, every where obvious on the ſurface of the ground, called alſo natural or mother earth; by ſome alſo loam.

MOULDINESS, a term applied to bodies which corrupt in the air, from ſome hidden principle of humidity therein; and whoſe corruption ſhews itſelf by a certain white down, or lanugo, on their ſurface, which, viewed through a microſcope, appears like a kind of meadow, out of which ariſe herbs and flowers, ſome only in the bud, others full blown, and others decayed, each having its root, ſtalk, and other parts.

MOULDING, any thing caſt in a mould, or that ſeems to have been ſo, though in reality it were cut with a chiſſel, or the ax.

MOULDINGS, in architecture, projectures beyond the naked wall, column, wainſcot, *&c.* the aſſemblage of which forms corniches, door-caſes, and other decorations of architecture. See ARCHITECTURE.

MOULINET, is uſed, in mechanics, to ſignify a roller, which being croſſed with two levers, is uſually applied to cranes, capſtans, and other ſorts of engines of the like nature, to draw ropes, and heave up ſtones, *&c.*

MOULINET is alſo a kind of turnſtile, or wooden croſs, which turns horizontally upon a ſtake fixed in the ground; uſually placed in paſſages to keep out horſes, and to oblige paſſengers to go and come one by one. Theſe moulinets are often ſet near the outworks of fortified places at the ſides of the barriers, through which people paſs on foot.

MOUND, a term uſed for a bank or rampart, or other fence, particularly that of earth.

MOUND, in heraldry, a ball or globe with a croſs upon it, ſuch as our kings are uſually drawn with, holding it in their left hand, as they do the ſceptre in the right.

MOUNT, an elevation of earth, called alſo mountain. See MOUNTAIN.

MOUNT ST MICHAEL, a borough town of Cornwal, ſituated on a bay of the Engliſh channel, called Mount-bay, eighteen miles weſt of Falmouth.

It ſends two members to parliament.

MOUNT-SORREL, a market town of Leiceſterſhire, ſeven miles north of Leiceſter.

MOUNT *of Piety*, certain funds or eſtabliſhments in Italy, where money is lent out, on ſome ſmall ſecurity. We had alſo mounts of piety in England, raiſed by contribution for the benefit of people ruined by the extortions of the Jews.

MOUNTAIN, a part of the earth, riſing to a conſiderable height above the level of the ſurface thereof.

MOUSE, in zoology. See MUS.

MOUSE-EAR, in botany. See HIERACHIUM.

MOUSE-TAIL. See MYOSURUS.

Dor-MOUSE. See SOREX.

Sea-MOUSE. See APHRODITA.

MOUSEL, or MOSUL, a city of Aſiatic Turky, in the province of Diarbec, or Meſopotamia, ſituated on the river Tigris, oppoſite the place where Nineveh ſtood; E. long. 43°, and N. lat. 36°.

MOUTH, in anatomy. See ANATOMY, p. 299.

MOUTH is uſed in the courts of princes, for what relates to their eating and drinking: Hence officers of the mouth, yeomen of the mouth.

MSCYSLAW, the capital of the palatinate of Miſcyſlaw in Poland, ſituated on the frontiers of Muſcovy: E. long. 31° 30′, and N. lat. 54° 34′.

MUCILAGE, in pharmacy, is in general any viſcid and glutinous liquor.

MUCILAGE alſo imports the liquor which principally ſerves to moiſten the ligaments and cartilages of the articulations; and is ſupplied by the mucilaginous glands.

MUCOR, in botany, a genus of the cryptogamia fungi claſs. It conſiſts of ſmall bladders, containing numerous ſeeds. There are twelve ſpecies, ſeven of them natives of Britain.

MUCRO CORDIS, in anatomy, the lower or pointed end of the heart.

MUCUS, a mucilaginous liquor ſeparated by the mucous glands and the noſtrils. See ANATOMY.

MUER, a town of Germany, in the circle of Auſtria, and duchy of Stiria, ſituated on the river Muer, twenty-five miles north weſt of Gruz.

MUFFLE, in Chemiſtry. See CHEMISTRY, p. 109.

MUFTI, the chief of the eccleſiaſtical order, or primate of the muſſelman religion. The authority of the mufti is very great in the Ottoman empire; for even the ſultan himſelf, if he would preſerve any appearance of religion, cannot, without hearing his opinion, put any perſon to death, or ſo much as inflict any corporal puniſhment. In all actions, eſpecially criminal ones, his opinion is required, by giving him a writing, in which the caſe is ſtated, under feigned names; which he ſubſcribes with the words, *He ſhall*, or *ſhall not be puniſhed*. Such outward honour is paid to the mufti, that the grand ſeignior himſelf riſes up to him, and advances ſeven ſteps to meet him, when he comes into his preſence. He alone has the honour of kiſſing the ſultan's left ſhoulder, whilſt the prime vizier kiſſes only

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only the hem of his garment. When the grand ſeignior addreſſes any writing to the mufti, he gives him the following titles, "To the eſad, the wiſeſt of the wiſe, inſtructed in all knowledge, the moſt excellent of excellents, abſtaining from things unlawful, the ſpring of virtue and true ſcience, heir of the prophetic doctrines, reſolver of the problems of faith, revealer of the orthodox articles, key of the treaſures of truth, the light to the doubtful allegories, ſtrengthened with the grace of the ſupreme legiſlator of mankind, may the moſt high God perpetuate thy virtues." The election of the mufti is ſolely in the grand ſeignior, who preſents him with a veſt of rich ſables, *&c.* If he is convicted of treaſon, or any great crime, he is put into a mortar, kept for that purpoſe in the Seven Towers at Conſtantinople, and pounded to death.

MUGGLETONIANS, a religious ſect which aroſe in England, about the year 1657; ſo denominated from their leader Lodowick Muggleton, a journeyman taylor, who, with his aſſociate Reeves, ſet up for great prophets, pretending, as it is ſaid, to have an abſolute power of ſaving and damning whom they pleaſed; and giving out that they were the two laſt witneſſes of God that ſhould appear before the end of the world.

MUGIL, in itchthyology, a genus of fiſhes belonging to the order of abdominales. The lips are membranaceous, the inferior one being carinated inwards; they have no teeth; the branchioſtege membrane has ſeven crooked rays; the opercula are ſmooth and round; and the body is of a whitiſh colour. There are two ſpecies diſtinguiſhed by the number of rays in the back fin.

MUG-WORT, in botany. See ARTEMISIA.

MUID, a large meaſure, in uſe among the French, for things dry. The muid is no real veſſel uſed as a meaſure, but an eſtimation of ſeveral other meaſures, as the ſeptier, mine, minot, buſhel, *&c.*

MUID, is alſo one of the nine caſks, or regular veſſels uſed in France, to put wine and other liquors in. The muid of wine is divided into two demi-muids, four quarter-muids, and eight half-quarter-muids, containing 36 ſeptiers.

MULL, one of the weſtern iſlands of Scotland, being part of the ſhire of Argyle, and lying to the weſtward of it: this iſland is twenty-four miles long, and in ſome places as many broad.

MULL *of Cantire*, the ſouth cape or promontory of the county of Cantire or Mul, in the frith of Clyde, on the weſt of Scotland.

MULL *of Galloway*, the ſouth cape or promontory of all Scotland, in the county of Galloway, on the Iriſh ſea.

MULATTO, a name given in the Indies to thoſe who are begotten by a negro man on an Indian woman, or an Indian man on a negro woman.

MULBERRY, in botany. See MORUS.

MULCT, a fine of money laid upon a man who has committed ſome fault or miſdemeanor.

MULDAW, a river of Bohemia, that ariſes on the confines of Auſtria, and running north, through Bohemia, unites with the Elbe at Melnick.

MULE, in zoology, a mongrel kind of quadruped, uſually generated between an aſs and a mare, and ſometimes between a horſe and a ſhe-aſs.

MULLERAS, a town of Germany, in the circle of Upper Saxony, and marquiſate of Brandenburg, ſituated thirty-eight miles ſouth-eaſt of Berlin.

MULLET, in ichthyology. See MUGIL.

MULLET, or MOLLET, in heraldry, a bearing in form of a flat, or rather of the rowel of a ſpur, which it originally repreſented.

The mullet has but five points; when there are ſix it is called a ſtar; though others make this difference, that the mullet is, or ought to be, always pierced, which a ſtar is not. See plate CVI. The mullet is uſually the difference or diſtinguiſhing mark for the fourth ſon, or third brother, or houſe; though it is often borne alone, as coat armour.

MULSUM, a liquor made of wine and honey, or even of wine and water.

MULTAN, or MOUTAN, a city of hither India in Aſia, capital of the province of Multan, ſituated on the river Indus. E. long. 72° 15′, N. lat. 30°.

MULTIPLE, in arithmetic, a number which comprehends ſome other ſeveral times, thus 6 is a multiple of 2, and 12 is a multiple of 6, 4, and 3, comprehending the firſt twice, the ſecond thrice, *&c.*

Action of MULTIPLEPOINDING, in Scots law. See LAW, Tit. XXX. 24.

MULTIPLICAND, in arithmetic. See ARITHMETIC, p. 371.

MULTIPLICATION, in general, the act of increaſing the number of any thing.

Multiplication in arithmetic, is a rule by which any given number may be ſpeedily increaſed, according to any propoſed number of times. See ARITHMETIC, p. 371.

MULTIPLICATION, in algebra. See ALGEBRA, p. 81.

MULTIPLICATOR, or MULTIPLIER, in arithmetic. See ARITHMETIC, p. 371.

MULTIPLYING GLASS, in optics, one wherein objects appear increaſed in number. See OPTICS.

MULTURE, in Scots law, the quantity of grain paid to the proprietor or tackſman of a mill for grinding. See LAW, Tit. XVI. 12.

MULVIA, a river of Barbary, in Africa, which riſes in the mountains of Atlas, and divides the empire of Morocco from the kingdom of Algiers, and then falls into the Mediterranean, weſt of Marſalquiver.

MUM, a kind of malt-liquor, much drank in Germany; and chiefly brought from Brunſwick, which is the place of moſt note for making it. The proceſs of brewing mum, as recorded in the town-houſe of that city, is as follows: Take ſixty-three gallons of water that has been boiled till one-third part is conſumed, and brew it with ſeven buſhels of wheaten malt, one buſhel of oat-meal, and one buſhel of ground beans; when it is tunned, the hogſhead muſt not be filled too full at firſt: as ſoon as it begins to work, put into it three pounds of the inner rind of fir, one pound of the tops of fir and beech, three handfuls of carduus benedictus, a handful or two of the flower of roſa ſolis; add burnet, betony,

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betony, marjoram, avens, penny royal, and wild thyme, of each a handful and a half; of elder flowers, two handfuls or more; ſeeds of cardamum bruiſed, thirty ounces; barberries bruiſed, one ounce; when the liquor has worked a while, put the herbs and ſeeds into the veſſel; and, after they are added, let it work over as little as poſſible; then fill it up: laſtly, when it is ſtopped, put into the hogſhead ten new-laid eggs unbroken; ſtop it up cloſe, and drink it at two years end. Our Engliſh brewers, inſtead of the inner rind of fir, uſe cardamum, ginger, and ſaſſafras; and alſo add elecampane, madder, and red ſanders. Mum, on being imported, pays for every barrel 1 l. 5 s.

MUMMY, a body embalmed or dried, in the manner uſed by the ancient Egyptians; or the compoſition with which it is embalmed. There are two kinds of bodies denominated mummies: the firſt are only carcaſes dried by the heat of the ſun, and by that means kept from putrefaction: Theſe are frequently found in the ſands of Lybia. Some imagine, that theſe are the bodies of deceaſed people buried there on purpoſe to keep them entire without embalming; others think they are the carcaſes of travellers, who have been overwhelmed by the clouds of ſand raiſed by the hurricanes frequent in thoſe deſarts. The ſecond kind of mummies are bodies taken out of the catacombs near Cairo, in which the Egyptians depoſited their dead after embalming.

We have two different ſubſtances preſerved for medicinal uſe under the name of mummy, though both in ſome degree of the ſame origin. The one is the dried and preſerved fleſh of human bodies, embalmed with myrrh and ſpices; the other is the liquor running from ſuch mummies, when newly prepared, or when affected by great heat or damps. The latter is ſometimes in a liquid, ſometimes of a ſolid form, as it is preſerved in vials well ſtopped, or ſuffered to dry and harden in the air. The firſt kind of mummy is brought to us in large pieces, of a lax and friable texture, light and ſpungy, of a blackiſh brown colour, and often damp and clammy on the ſurface: it is of a ſtrong but diſagreeable ſmell. The ſecond kind of mummy, in its liquid ſtate, is a thick, opake, and viſcous fluid, of a blackiſh colour, but not diſagreeable ſmell. In its indurated ſtate, it is a dry ſolid ſubſtance, of a fine ſhining black colour, and cloſe texture, eaſily broken, and of a good ſmell; very inflammable, and yielding a ſcent of myrrh and aromatic ingredients while burning. This, if we cannot be content without medicines from our own bodies, ought to be the mummy uſed in the ſhops; but it is very ſcarce and dear; while the other is ſo cheap, that it will always be moſt in uſe.

All theſe kinds of mummy are brought from Egypt. But we are not to imagine, that any body breaks up the real Egyptian mummies, to ſell them in pieces to the druggiſts, as they may make a much better market of them in Europe whole, when they can contrive to get them. What our druggiſts are ſupplied with, is the fleſh of executed criminals, or of any other bodies the Jews can get, who fill them with the common bitumen ſo plentiful in that part of the world; and adding a little aloes, and two or three other cheap ingredients, ſend them to be baked in an oven, till the juices are exhaled, and the embalming matter has penetrated ſo thoroughly that the fleſh will keep and bear tranſporting into Europe. Mummy has been eſteemed reſolvent and balſamic: but whatever virtues have been attributed to it, ſeem to be ſuch as depend more upon the ingredients uſed in preparing the fleſh, than in the fleſh itſelf; and it would ſurely be better to give thoſe ingredients without ſo ſhocking an addition.

MUMMY, among gardeners, a kind of wax uſed in grafting and planting the roots of trees, made in the following manner: Take one pound of black pitch, and a quarter of a pound of turpentine; put them together into an earthen pot, and ſet them on fire in the open air, holding ſomething in your hand to cover and quench the mixture in time, which is to be alternately lighted and quenched till all the nitrous and volatile parts be evaporated. To this a little common wax is to be added; and the compoſition is then to be ſet by for uſe.

MUNGATS, or MUNKATS, a town of upper Hungary: E. long. 22°, N. lat. 48° 30′.

MUNICH, a large and elegant city, the capital of the electorate and dutchy of Bavaria ſituated on the river Iſer: E. long. 11° 32′, N. lat. 48° 5′.

MUNICIPAL, in the Roman civil law, an epithet which ſignifies inveſted with the rights and privileges of Roman citizens. Thus the municipal cities were thoſe whoſe inhabitants were capable of enjoying civil offices in the city of Rome: Theſe cities, however, according to Mariana, had fewer privileges than the colonies: They had no ſuffrages or votes at Rome; but were left to be governed by their own laws and magiſtrates. Some few municipal cities, however, obtained the liberty of votes.

Municipal, among us, is applied to the laws that obtain in any particular city or province. And thoſe are called municipal officers who are elected to defend the intereſt of cities, to maintain their rights and privileges, and to preſerve order and harmony among the citizens; ſuch as mayors, ſheriffs, conſuls, &c.

MUNITION, the proviſions with which a place is furniſhed in order for defence; or that which follows a camp for its ſubſiſtence.

MUNSTER, the capital of the biſhoprick of the ſame name, and of the circle of Weſtphalia, ſituated on the river Aa: E. long. 7° 10′, N. lat. 52°.

MUNSTER, is alſo a town of Germany, in the Landgraviate of Alſatia, ſubject to France: E. long. 7° 5′, N. lat. 48° 8′.

MUNSTER MEINFELT, a town of Germany, in the circle of the lower Rhine, and electorate of Triers: E. long. 7°, N. lat. 50° 15′.

MUNSTERBERG, the capital of the duchy of the ſame name in Sileſia: E. long. 16°, N lat. 50° 35′.

MUNTINGIA, in botany, a genus of the polyandria monogynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; and the berry has one cell containing many ſeeds. There is but one ſpecies, a native of America.

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MURÆNA, or EEL, in ichthyology, a genus of fiſhes belonging to the order of apodes. The head is ſmooth; there are ten rays in the membrane of the gills; the eyes are covered with a common ſkin; and the body is cylindrical, and ſlimy. There are ſeven ſpecies, diſtinguiſhed by their fins, tail, &c.

MURCIA, the capital of the province of the ſame name in Spain: W. long. 1° 12′, N. lat. 38° 6′.

MURDER, or MURTHER, in law, is the wilful and felonious killing a perſon from premeditated malice; provided the party wounded, or otherwiſe hurt, die within a year and a day after the fact was committed. See LAW, Tit. XXXIII.

MURDERERS, or MURDERING-PIECES, in a ſhip, are ſmall pieces of ordnance, either of braſs or iron, which have chambers put in at their breeches. They are uſed at the bulk-heads of the fore-caſtle, half-deck, or ſteerage, in order to clear the deck, on the ſhip's being boarded by an enemy.

MURENGERS, two officers of great antiquity in the city of Cheſter, annually choſen out of the aldermen, to ſee that the walls are kept in repair, and to receive a certain toll and cuſtom for the maintenance thereof.

MUREX, in zoology, a genus of inſects belonging to the order of vermes teſtacea. This animal is of the ſnail kind; the ſhell conſiſts of one ſpiral valve, rough with membranaceous furrows; and the aperture terminates in an entire canal either ſtreight or ſomewhat aſcending. There are 60 ſpecies, particularly diſtinguiſhed by peculiarities in their ſhells, &c.

MURIA, ALIMENTARY SALT. See SALT.

MURO, a town of Italy, in the kingdom of Naples, ſixty miles ſouth-eaſt of the city of Naples.

MURRAIN, or GARGLE, a contagious diſeaſe among cattle.

The ſymptoms of this diſeaſe are a hanging down and ſwelling of the head, abundance of gum in the eyes, rattling in the throat, a ſhort breath, palpitation at the heart, ſtaggering, a hot breath, and a ſhining tongue.

In order to prevent this diſeaſe, the cattle ſhould ſtand cool in ſummer, have plenty of good water; all carrion ſhould be ſpeedily buried; and as the feeding of cattle in wet places, on rotten graſs and hay, often occaſions this diſeaſe, dry and ſweet fodder ſhould be given them.

MURRAY, a county of Scotland, bounded by the German Sea, on the north; by Banff, on the eaſt; by Mar and Badenoch, on the ſouth; and by Inverneſs, on the weſt.

MURREY, in heraldry, a kind of purple colour. See SANGUINE.

MUS, in zoology, a genus of quadrupeds, belonging to the order of glires; the generic character of which is, that the fore-teeth of the lower jaws are ſubulated. There are 21 ſpecies. 1. The porcellus, or guinea-pig, has no tail; there are four toes on the fore-feet, and three on the hind ones. This animal makes a grunting noiſe, is very reſtleſs, and ſtamps with its hind-feet when teazed. It loves heat, and feeds upon various vegetables. The female has two dugs. The colour is very various. It is a native of Braſil. 2. The aguti has a ſhort tail, four toes on the fore-feet, three on the hind ones, and a yellowiſh belly. It is a native of Braſil, Surinam, and Guinea. 3. The leporinus has the ſame characters with the former, only the belly is white. It is found in Java and Sumatra. 4. The citellus has a ſhort tail, an aſh-coloured body, and no ears. It is found in Bohemia, &c. below ground. 5. The lemmus, has a ſhort tail, five toes on both fore and hind-feet, and the body is variegated with green and yellow. They are found in the Lapland mountains under little hillocks, and feed ſolely on vegetables. 6. The paca, has a ſhort tail, five toes on each foot, and there are three yellowiſh lines on each ſide. It is a native of Braſil. 7. The marmota has a ſhort hairy tail, round ears, and gibbous cheeks. It digs deep holes in the earth with amazing quickneſs; ſleeps profoundly during the winter; lifts its food to its mouth with the fore-feet; often ſits erect; it is eaſily tamed, and is found in Switzerland. 8. The monax has a hairy tail, an aſh-coloured body, roundiſh ears, and four toes on the fore feet and five on the hind ones. It is a native of America. 9. The cricetus has a tail of a moderate length, round ears, a black belly, and reddiſh ſides, with three white ſpots. This animal digs deep caverns in the earth, divided into many different cells, in which it depoſites and preſerves large quantities of fruits and grains. The female brings forth ſix young ones twice in the year, each of which lives in a ſeparate cell. They are hunted for food, for their ſkins, and even for the quantity of grain found in their cells. It is a native of Germany. 10. The terreſtris has a hairy tail, with four toes on the fore-feet, and five on the hind ones, and ears ſhorter than the hair. This animal, which is about half the ſize of a rat, digs in the gardens like a mole, and eats the bark off the roots of trees, &c. It ſwims in ditches, and devours young ducks in the ponds. It is a native of Europe. 11. The amphibious has a long hairy tail, with palmated feet. It digs in the banks of ditches and under the roots of trees, and feeds upon vegetables. It is found both in Europe and Africa. 12. The rattus, or rat, has a long naked tail, four toes on the fore-feet, and five on the hind ones, and a claw on the large toe. This animal infeſts the houſes every where through Europe, and is devoured by cats and other animals of the ſame claſs. It is reported by ſeveral authors, that rats were originally tranſported from America in a ſhip belonging to Antwerp. 13. The muſculus, or common mouſe, has a long naked tail, four toes on the fore-feet and five on the hind ones, but has no claw on the large toe. This animal is a native of Europe, feeds upon grain and fleſh of all kinds. 14. The avellanarius has a long hairy tail, a reddiſh body, a white throat, and the hind toes have no claws. It frequents the woods of Europe, feeds upon nuts, which it lays up in the earth, and ſleeps during winter. 15. The quercinus has a long hairy tail, with a black ring under the eyes. It is a native of the ſouth of Europe. 16. The gregarius has a tail about one third of the length of its body, and ſomewhat hairy; the body is of a greyiſh colour, and the legs are white.

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Fig. 1. MUS PORCELLUS or Guiney Pig

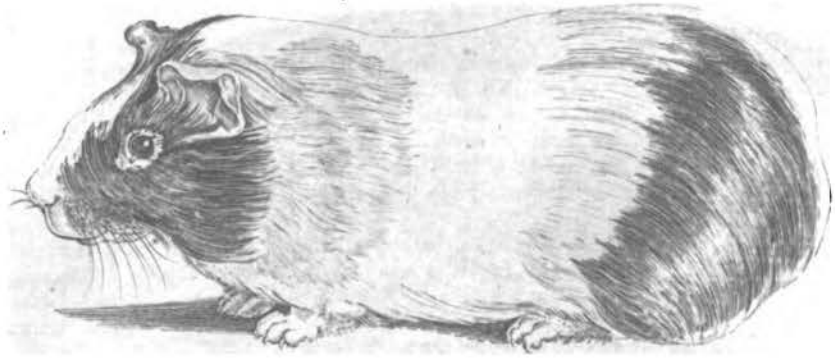

Fig. 2. MUS AGUTI

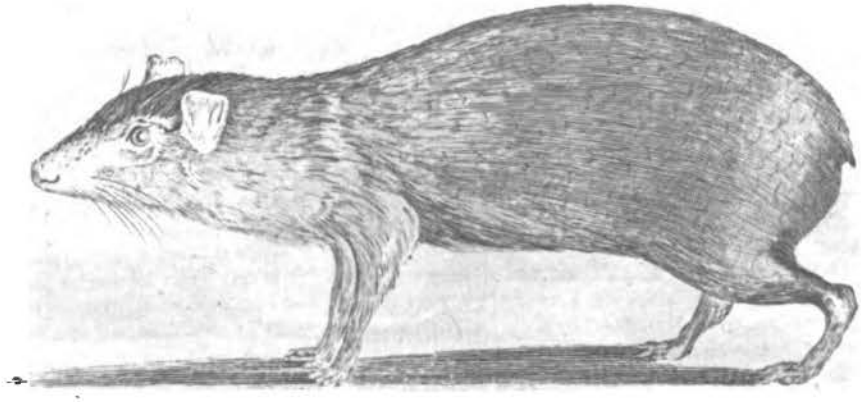

Fig. 3. MUS AVELLONARIUS

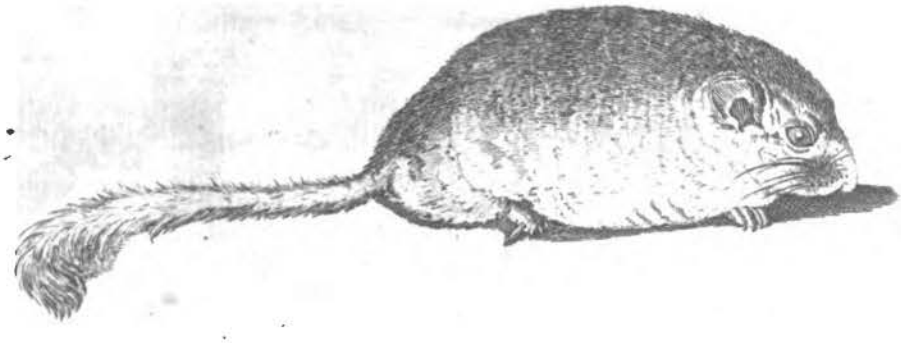

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Fig. 1. MUS MARMOTTA
or Alpin mouse.

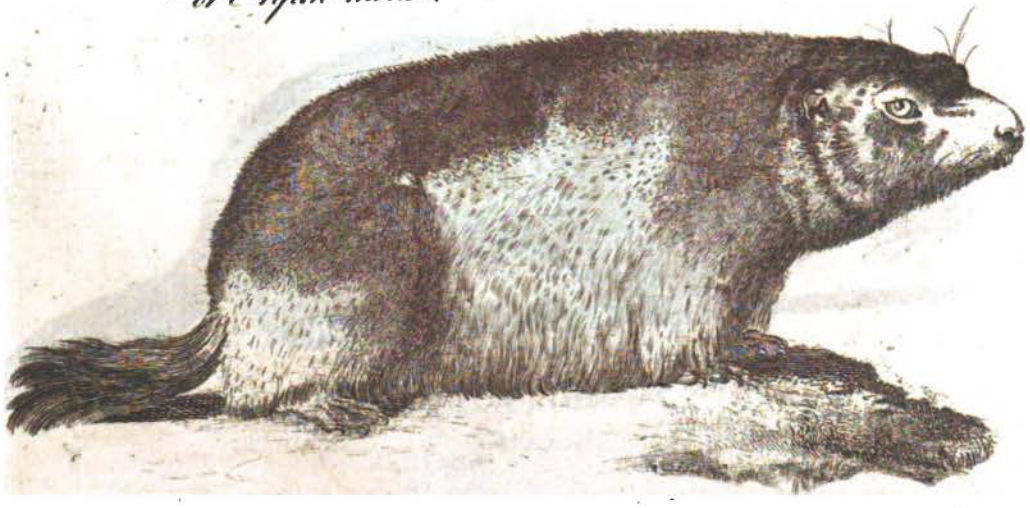

Fig. 2. MUS VOLANS
or Flying Squirrel.

Fig. 3. MUS TELA LUTRA or Otter.

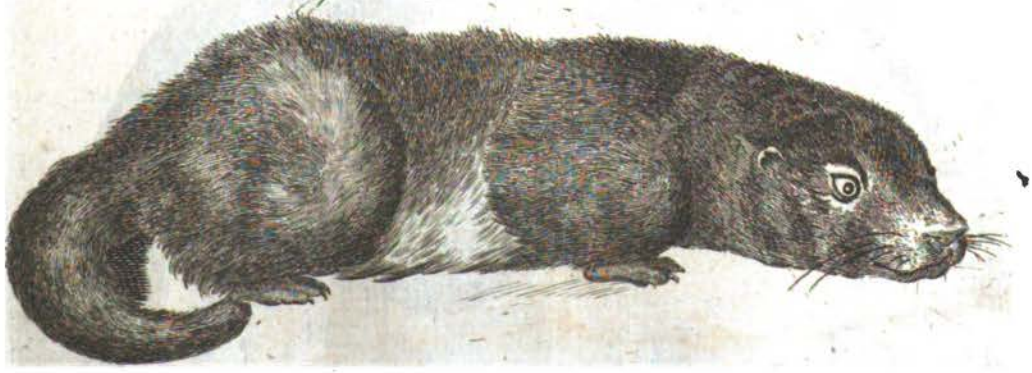

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Fig. 1. MUSTELA PUTORIUS *or Polecat.*

Fig. 2. MUSTELA FURO *or Ferret.*

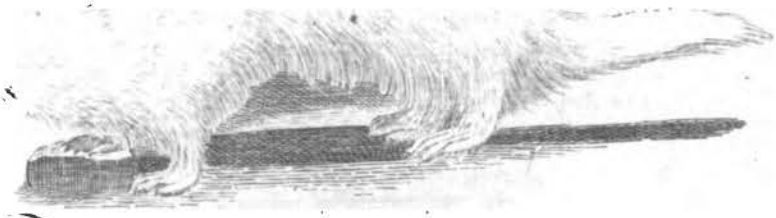

Fig. 4. MYRMECOPHAGA.

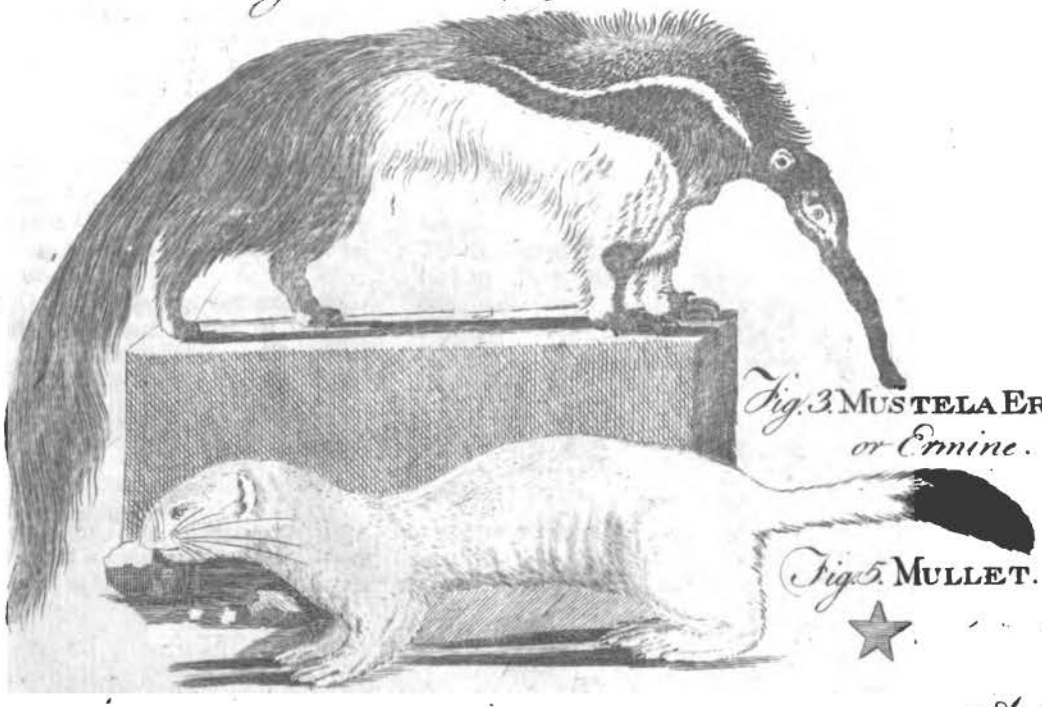

Fig. 3. MUSTELA ERMINA
or Ermine.

Fig. 5. MULLET.

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It is a native of Germany. 17. The ſylvaticus has a tail of a middling length, four toes on the fore feet, and five on the hind ones; the body is grey, interſperſed with black hairs, and the belly is white. It is found in the gardens and woods of Europe. 18. The ſtriatus has four toes on the fore-feet, and five on the hind ones; it has longitudinal ſtreaks on the body, with white ſpots. It is a native of India. 19. The longipes has a long covered tail, four toes on the fore-feet, five on the hind ones, and very long thighs. It is found in the torrid zone. 20. The jaculus has a long fleecy tail, with very long thighs, and ſhort fore-legs. It walks on its hind-feet only, and has a jumping motion. It is found in Arabia, Egypt, *&c.* 21. The volans has a long hairy tail, four toes on the fore feet and five on the hind ones, and the ſkin from the ears to the tail is extended like wings, by which it is enabled to fly. It is a native of Virginia and Mexico.

MUSA, the PLAINTAIN-TREE, in botany, a genus of the polygamia monœcia claſs. The calix is a ſpatha: the corolla conſiſts of two petals; one of them ſtraight and teethed; and the other is concave, ſhort, and furniſhed with a nectarium. It has ſix filaments, and one ſtylus. There are four ſpecies, all natives of the Indies.

MUSCA, in zoology, a genus of inſects belonging to the order of diptera. The mouth is furniſhed with a fleſhy proboſcis, and two lateral lips; it has no pappi. There are 129 ſpecies, principally diſtinguiſhed by peculiarities in their feelers.

MUSCADINE, a rich kind of wine, of the growth of Provence and Languedoc, in France.

MUSCLE, in anatomy. See ANATOMY, p. 192.

MUSCLE, in natural hiſtory. See MYTULUS.

MUSEUM, a name which originally ſignified a part of the palace of Alexandria, which took up at leaſt one fourth of that city. This quarter was called the Muſeum, from its being ſet apart for the muſes and the ſtudy of the ſciences. Here were lodged and entertained the men of learning; who were divided into many companies or colleges, according to the ſciences of which they were the profeſſors; and to each of theſe houſes or colleges was allotted a handſome revenue. The foundation of this eſtabliſhment is attributed to Ptolemy Philadelphus, who here placed his library. Hence the word Muſeum is now applied to any place ſet apart as a repoſitory for things that have an immediate relation to the arts.

The Muſeum at Oxford, called the Aſhmolean Muſeum, is a noble pile of building, erected at the expence of the univerſity, at the weſt end of the theatre, at which ſide it has a magnificent portal, ſuſtained by pillars of the Corinthian order. The front, which is to the ſtreet, extends about ſixty feet, where there is this inſcription over the entrance, in gilt characters, *Muſeum Aſhmoleanum, ſchola naturalis hiſtoriæ, officina chymica.*

It was begun in 1679, and finiſhed in 1683, when a valuable collection of curioſities was preſented to the univerſity by Elias Aſhmole, Eſq. which were the ſame day repoſited there. And ſeveral acceſſions have been ſince made to the Muſeum; among which are hieroglyphics and other Egyptian antiquities, an entire mummy, Roman antiquities, altars, medals, lamps, *&c.* and a variety of natural curioſities.

The Britiſh Muſeum in London is a large, beautiful, and magnificent building, and the nobleſt cabinet of curioſities in the world. This edifice was erected in 1677, and was called Montague-houſe, from having been the town reſidence of the dukes of Montague. In the year 1753, the Britiſh parliament having paſſed an act for purchaſing the Muſeum of the late Sir Hans Sloan, and the collection of manuſcripts of the late lord Oxford, called the Harleian Library, for the uſe of the public; 26 truſtees were appointed and incorporated, to provide a repoſitory for thoſe and ſome other collections, which repoſitory was to be called the Britiſh Muſeum. Theſe truſtees elected fifteen other truſtees; and having bought Montague-houſe, fitted it up for the reception of theſe collections: they alſo appointed officers to ſuperintend the muſeum; and having ordained certain ſtatutes with reſpect to viewing the collection contained in it, the public were admitted to view it in 1757.

MUSES, certain fabulous divinities amongſt the pagans, ſuppoſed to preſide over the arts and ſciences: for this reaſon it is uſual for the poets, at the beginning of a poem, to invoke theſe goddeſſes to their aid. Some reckon the muſes to be no more than three, *viz.* Mneme, Acede, and Melete; that is, memory, ſinging, and meditation: but the moſt ancient authors, and particularly Homer and Heſiod, reckon nine; *viz.* Clio, which means glory; Euterpe, pleaſing; Thalia, flouriſhing; Melpomene, attracting; Terpſichore, rejoicing the heart; Erato, the amiable; Polyhymnia, a multitude of ſongs; Urania, the heavenly; and Calliope, ſweetneſs of voice. To Clio, they attributed the invention of hiſtory; to Melpomene, tragedy; to Thalia, comedy; to Euterpe, the uſe of the flute; to Terpſichore, the harp; and to Erato, the lyre and lute; to Calliope, heroic verſe; to Urania, aſtrology; and to Polyhymnia, rhetoric.

MUSHROOM, in botany. See FUNGUS.

MUSICK.

MUSICK is one of the ſeven ſciences commonly called liberal; and is comprehended alſo among the mathematical, as having for its object diſcrete quantity or number, but not conſidering it in the abſtract like arithmetick, but in relation to time and ſound, in order to make a delightful harmony: Or it is the art of diſpoſing

diſpoſing and conducting ſounds conſidered as acute and grave; and proportioning them among themſelves, and ſeparating them by juſt intervals pleaſing to the ſenſe.

Mr Malcome defines it a ſcience that teaches how ſound, under certain meaſures of time and tune, may be produced; and ſo ordered and diſpoſed, as either in conſonance (*i. e.* joint-ſounding,) or ſucceſſion, or both, they may raiſe agreeable ſenſations.

From this definition, the ſcience naturally divides into two general parts, *viz.* theoretical and practical.

PART I. THE THEORY OF MUSICK.

CHAP. I. OF MUSICAL SOUNDS.

AXIOM I. The ear is the ſole judge of ſound. Every ſound is not a muſical ſound. For to this two things are required: firſt, That the ſound pleaſe the ear; ſecondly, That it be within a certain compaſs. A muſical ſound is clear, uninterrupted, and uniform; and ought not to exceed the power of the ear to judge of it.

For ſounds, very deep or very high, are not eaſily diſtinguiſhed, but by an ear very converſant in muſick.

Sound being a ſimple idea, cannot be defined but by an imperfect deſcription of its cauſe; which is an undulatory motion of the air, communicated by the vibration of the parts of bodies to the organ of hearing.

The diverſities of ſounds, and their proportions, are perfectly diſcerned by the ear, are the object of the theory of muſick, the grounds and principles of the practice, as well as the cauſes of pleaſure in the ſenſe and imagination.

Theſe diverſities of ſounds are expreſſed by the terms high and low, acute and grave, or ſharp and flate. Hence, from any given ſound, we can conceive a ſucceſſion of them; wherein the laſt in order is more acute than the foregoing; and this ſeries is called notes aſcending.

Or, on the contrary, when, in a ſucceſſion of ſounds, the laſt in order is more grave than the former; this ſeries is called notes deſcending.

AXIOM II. From this order of notes aſcending and deſcending are deduced all the proportions of ſounds; the properties of the ſame proportions; and the relations which ariſe out of their various combinations and ſucceſſions. Theſe include the whole buſineſs of harmony and melody; and the knowledge of them is the ground work or baſis of the ſcience of muſick.

COROLLARY I. Hence nothing can be admitted in muſical compoſition which doth not immediately depend on the foregoing axiom, and which cannot be demonſtrated from it.

Sect. 2. *Of the* DIVERSITY *of* SOUNDS.

THE diverſity of ſounds ſucceeding in the natural order is not however extended through any number of ſounds which may be expreſſed by a muſical inſtrument, or even by the human voice. For univerſal experience, conducted by the judgment of the ear, hath demonſtrated and aſcertained the number ſeven to comprehend all the variety that muſick is capable of affording. Therefore, the number eight is the bound or limit of the materials of muſical compoſition; and this eighth note or ſound is called an octave.

This octave may be conceived as unity, or the firſt note of another ſeries aſcending or deſcending.

This ſeries, though it may be repeated at pleaſure, muſt ſtill come under the reſtriction above mentioned; which is, that it muſt not exceed the power of the ear to judge of it. The greateſt compaſs of the human voice will ſcarcely reach above two octaves, or fifteen notes. Inſtruments are framed with more, to anſwer the moſt intereſting purpoſe of muſick, which is variety.

The ſeven ſounds in muſic are named from the firſt ſeven letters of the alphabet, viz. A,B,C,D,E,F,G.

The diſtance between any two of thoſe, whether immediate or remote, is called an interval. And every interval is named from the natural numbers; beginning at unity.

In naming of an interval, it is alway underſtood of the aſcending notes; and both terms are incluſive. Thus AB is called a 2d, AE a 5th, BE a 4th, EG a 3d, AA an 8th or octave; and ſo of the reſt.

We proceed now to lay down an exact deſcription of all the intervals in muſic. For from the knowledge of theſe are diſcovered all the proportions which conſtitute harmony; and upon which the whole ſuperſtructure of muſick is raiſed.

Firſt, of the intervals of ſounds lying in their natural order. Of theſe there are ſeven intervals, named either the greater tone, the leſſer tone, and the half-tone or ſemitone. *See the Muſick Plates*, N°. 1, 2.

	Interval of a						
N°. 1.	Major	Minor	Semitone	Major	Minor	Major	Semitone
	Interval of a						
N°. 2.	Major	Semitone	Minor	Major	Semitone	Minor	Major

In this ſeries of 8 notes are contained 5 whole tones; three greater, and two leſſer; and 2 ſemitones. Reducing them therefore to the loweſt denomination, they will be found to contain 12 half-tones; and incluſively 13. Every octave then contains 13 half tones; out of the various combinations of which ariſe the ſeveral concords and diſcords, as will be ſhewn in its proper place. The leſſer tones are alike divided into half tones, as are the greater. We ſhall therefore, for brevity ſake, hereafter uſe the diſtinction only of whole tones and half tones: the reaſon for which ſhall be aſſigned below.

From the inequality in the order of theſe intervals we draw the following corollary.

COR-

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Cor. II. Harmonical proportion is of a ſpecies different from all other proportions, and can be demonſtrated only from principles peculiar to itſelf. This will be ſeen when we come to ſhew the method of dividing a line harmonically; as well as from the proportion ſtated in numbers.

The firſt of the notes in the examples above is called the key-note, or key. Notwithſtanding the intervals may be reckoned from any given note; yet it will anſwer our purpoſe better to begin with the key.

In the firſt example,

The firſt interval, or diſtance between the key and ſecond, contains 2

Between the 2d and 3d	2	
3d and 4th	1	
4th and 5th	2	Semitones.
5th and 6th	2	
6th and 7th	2	
7th and 8th	1	

In the ſecond example,

The firſt interval, or diſtance between the key and ſecond, contains 2 ſemitones.

Between the 2d and 3d	1	
3d and 4th	2	
4th and 5th	2	Semitones.
5th and 6th	1	
6th and 7th	2	
7th and 8th	2	

From this compariſon of the two ſeries, it is evident there is but one difference, and this ariſing from the order of the notes, or place of the ſemitone. For if you begin to read the ſecond ſeries at the interval between the 3d and 4th, the ſemitones will be found exactly in the ſame order as in the firſt example.

In the firſt example, the firſt ſemitone falls on the 4th note, or that which is next above the 3d to the key; which 3d is 5 half tones above the key inclufively. In the 2d example, the half-tone falls on the 3d note; and is therefore itſelf the third to the key, and is four half-tones above the key inclufively.

This diſtinction of the place of the ſemitone is moſt worthy of obſervation, it being the only eſſential difference of tune, the ground-work of all that beautiful variety which may be introduced in the air or melody, as well as it is the principle or hinge on which turns the reſolution of every diſcord. The key-note of every tune is that whereon the tune ends; which though it may be altered for variety in the upper part, yet the laſt note of the baſs is ever the key.

When the 3d to the key is 5 ſemitones to the key, as in the firſt example, that tune is ſaid to be compoſed in a ſharp key. When the 3d to the key is 4 ſemitones to the key, as in the ſecond example, the tune is in a flat key. And this, as was ſaid before, is the only difference in tune.

This diſtinction of flat and ſharp third holds good, not only in relation to the key, but likewiſe to every note in the ſcale of muſick. And in this light it is the foundation of compoſing in different keys; of changing the key in the ſame tune which introduces the ſo much deſired variety in muſick: and of writing the ſame tune in divers keys, which is called tranſpoſition. Hence we eſtabliſh the following axioms:

Axiom III. As the difference of the flat and ſharp third to the key conſtitutes the key, and is eſſential to the tune: ſo no tune compoſed in a ſharp key can be compoſed into a flat one, nor a flat into a ſharp; for that would be altering the permanent nature of things.

The truth of this axiom will moſt evidently appear, when we ſhall, in the ſecond part, or practice, have learned the art of tranſpoſition.

Axiom IV. The great and conſtant object which muſt be ſought after in muſick, whether in compoſition, or performance of thorough baſs, is variety with uniformity. For the proportions already laid down, and the prodigious variety emerging from them, as they lie in the order of nature, before they are modified, divided or combined by art, do not only point out this variety to us; but the concords and diſcords likewiſe made out of theſe, and arranged by art, will not only not ſuffer us to recede from the eſtabliſhed precept, but by a kind of ſweet violence conſtrain us to purſue this darling object.

On the truth of this axiom is grounded the reaſon for the mixture of diſcord with harmony, and the occaſion of this precept in playing thorough baſs, namely, that the hands ſhould as much as poſſible move in a contrary direction.

As to the place of the other ſemitone, which in the flat key is on the 6th, the reaſon ſhall be told in its proper place. And moreover, it muſt be obſerved, that the greater 7th in the ſharp key, which cauſes the ſecond ſemitone to fall on the 8th in that key, is alſo common to the flat key in many paſſages, but unexceptionably at the end of the tune, or cloſe.

Sect. 3. *Of the* Concords *and* Discords.

Of the intervals ſtanding in their natural order are compounded the greater intervals, namely, the concords and diſcords.

Theſe are the next things to be conſidered. Now, to inveſtigate the order of theſe, and their proportions to each other, we muſt have recourſe to the original cauſe of ſound; that is, to the tremulous motion of the air, excited by the percuſſion of ſome ſolid body, as a bell, ſtring, or pipe.

This trembling of the air is in proportion quick or ſlow as the impreſſion given it by the voice or an inſtrument. The quicker the trembling is, the more acute the ſound; the ſlower, the more grave or flat. The ſame ſound is the effect of the ſame degree of quickneſs of the air's motion continued. Hence a ſtring ſounding the ſame note to the end of its vibration, proves, that the vibrations are in equal times, from the greateſt to the leaſt ranges of its motion.

The ſhorter a muſical ſtring is, the quicker are its vibrations, and therefore the more acute the ſound.

The longer a ſtring is, the more ſlow are its vibrations, and ſo the more grave the ſound.

Therefore, from the diviſion of a muſical ſtring, the proportions of acuteneſs or gravity are computed. Hence we raiſe the following axiom.

Axiom V. The quickneſs of the vibrations is reci-

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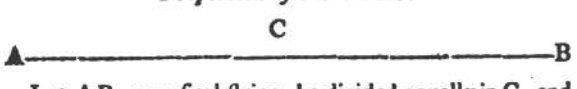
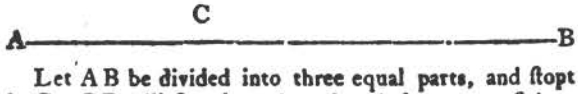
procal to the lengths. Thus in two ſtrings of the ſame matter, and equal diameters; if one be double the length of the other, it will give half the quickneſs of pulſes; that is, half the number of pulſes in the ſame time: or, the lengths being as 2 to 1, the vibrations are as 1 to 2. On this axiom are demonſtrated the order and proportions of the concords, as follows.

Proportion of the Octave.



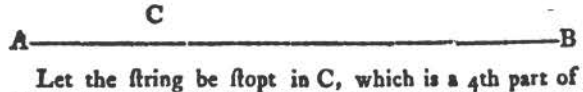
Let AB, a muſical ſtring, be divided equally in C, and ſtopt there: CB will ſound an octave to the whole or open ſtring AB. Now, CB, AB, are as 1 to 2: therefore, the vibrations are as 2 to 1; that is, the proportion of the octave or diapaſon is double, or 2 to 1. Q. E. D.

Proportion of the 5th.



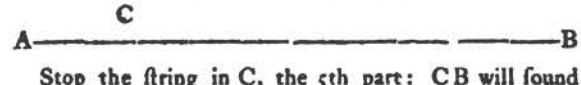
Let AB be divided into three equal parts, and ſtopt in C: CB will ſound a 5th to the whole or open ſtring. Now, CB is to AB as 2 to 3: therefore the vibrations are as 3 to 2; that is, the proportion of the 5th, or diapente, is ſeſquialteral, or 3 to 2.

Proportion of the 4th.



Let the ſtring be ſtopt in C, which is a 4th part of the whole: CB will ſound a 4th to the whole AB or open ſtring. Now, CB is to AB as 3 to 4: therefore the vibrations are as 4 to 3; or, the proportion of the 4th, or diateſſaron, is 4 to 3.

Proportion of the ſharp 3d.

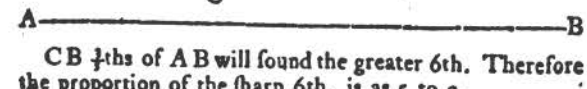


Stop the ſtring in C, the 5th part: CB will ſound a greater 3d to AB. But CB is to AB as 4 to 5. Therefore the vibrations are as 5 to 4; or, the proportion of the ſharp 3d is as 5 to 4.

Proportion of the flat 3d.

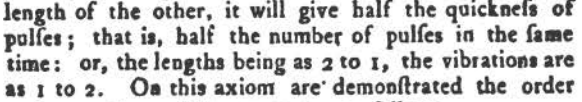
Stop in C the 6th part: CB will ſound the leſſer or flat third. But, *&c.* Therefore the proportion of the flat third is as 6 to 5.

Proportion of the greater or ſharp 6th.



CB $\frac{5}{8}$ths of AB will ſound the greater 6th. Therefore the proportion of the ſharp 6th, is as 5 to 3.

Proportion of the leſſer or flat 6th.



CB, $\frac{3}{5}$ths of AB, ſounds the leſſer 6th, Therefore the proportion of the flat 6th is as 8 to 5.

If theſe diviſions of the ſtring, whoſe numerators are the ſame, or unity, be ſet down in fractions, in the natural order of numbers, thus $\frac{1}{1}\frac{1}{2}\frac{1}{3}\frac{1}{4}$, *&c.* and reduced to a common denominator, the harmonical proportions will appear in the ſame ſucceſſion of concords, as inveſtigated by ſound in the diviſion of the ſame line; and the numerators, being by this reduction as whole numbers, will ſtand thus, 60, 40, 30, 24, *&c.* For the common denominator, 120, anſwering to the whole or open ſtring; the relative proportion of the ſame to the firſt fraction, and the relative proportion between each two ſucceſſive fractions, will expreſs the proportion of the harmonic chords. Thus $\frac{120}{60}\frac{2}{1}$ or 8th. $\frac{60}{40}\frac{3}{2}$ or 5th. $\frac{40}{30}\frac{4}{3}$ or 4th. $\frac{30}{24}\frac{5}{4}$ or ſharp 3d. Hence we diſcover relative harmonical proportion in numbers: which is, As the firſt is to the third; ſo is the difference of the firſt and ſecond to the difference of the ſecond and third. For, reducing the firſt three numbers to the loweſt terms, and inverting, they will be 2, 3, 6. Now 2:6::1:3. Again, reducing the ſecond three, they will be 3, 4, 6. Now 3:6::1:2. Whereever this proportion obtains, the numbers bear harmonical or muſical relation. Further, the rectangle, or quotient of the firſt and third numbers multiplied, being divided by the exceſs of twice the firſt above the ſecond, finds a fourth proportional. Thus 3, 4, 6, given as above; 3 multiplied by 6, gives 18: which divided by 2, the exceſs of twice 3, the firſt above 4 the ſecond, gives 9, the fourth muſical proportional. Thus 3, 4, 6, 9: And of theſe, the firſt is to the fourth, as the difference of the firſt and ſecond is to the difference of the third and 4th. So 3:9::1:3.

The harmonic proportion of three numbers in this natural ſucceſſion of fractions, extends as far as the chord of the flat 3d. Which third, being $\frac{1}{6}$ of the whole number, limits this equality of proportion, ſeeing that the number 7 is no aliquot part. But as to the fourth proportional, it cannot be found even from that number which expreſſes the ſharp 3d, which is ſtill of ſhorter extent. This limitation of proportion then explains the extent of harmony, and likewiſe becomes the principle of the ſame; as will be ſeen in the definition of harmony.

Hence it is evident, the remaining concords of the ſharp 6th, which is $\frac{5}{3}$, and of the flat 6th, or $\frac{8}{5}$, are not included in this equality of proportion.

Theſe are the concords, their order and proportions; any one of which ſounded together with the open ſtring, is concordant with it, and produces harmony.

Example of the names and order of the intervals in concord with the open ſtring or baſs, and the ſemitones contained in each, *Muſick Plates*, No. 3.

Again, two of theſe concordant intervals, namely, the
5th and —— 8th
Sharp 3d and —— 8th

Flat

Flat 3d and —— 8th
Sharp 3d and —— 5th
Flat 3d and —— 5th
Sharp 3d and Sharp 6th
Flat 3d and Flat 6th
6th and —— 4th
Flat 6th and —— 4th

ſounded with the open ſtring, or baſs note, are concordant all together; and therefore produce harmony.

Example of two concording with the open ſtring or baſs. No 4.

Next follows an example of three concording with the baſs. No. 5.

Having thus diſcovered the concords, their order and proportions; it is worth remarking, that the firſt concord, or 8th, which ariſes from the moſt ſimple diviſion of a line, is the moſt perfect concord; the 5th is the next perfect concord; and ſo of the reſt, in the order they have been found by the diviſion of the ſtring. For the nature and perfection of the 4th, accounted by ſome a very imperfect concord, ſhall be explained in the corollaries of the demonſtration of the harmony, in Part II. on practice.

The 8ths and 5ths then are called the perfect concords. The 3ds and 6ths imperfect concords. The 4th, of a middle nature between the others, may be called an improper concord; for this reaſon, that with the 6th, with which it is always accompanied in harmony, though it make perfect harmony with the given note, yet they change the chord into that of the 4th to that note.

Likewiſe the 6th, whether joined with the 3d or 4th to the given note, tho' it make perfect harmony with either, yet they change the chord into that of the 6th or 4th to the ſame note.

Hence the reaſon why the 6ths are more imperfect concords than the 3ds.

From the order and perfection of the concords thus diſcovered; we deduce the following corollary.

Cor. III. The moſt perfect harmony is that which will be produced by the perfect concords, namely, the 3d, 5th, and 8th. Thus No. 6.

From the foregoing corollary, we are able to give a juſt definition of harmony. Harmony conſiſts in one certain invariable proportion of diſtance of four ſounds performed at the ſame inſtant of time, and moſt pleaſing to the ear.

Theſe proportions of the firſt ſeries are called ſimple concords. If the notes of a ſecond ſeries be added to the firſt octave, the proportion of any two concording notes compounded with the octave retains the name and nature of the ſimple concord; as a tenth, compounded of an octave and third, is called a third; a twelfth, compounded of an octave and 5th, is called a fifth; a fifteenth, compounded of two octaves, is called an octave, or double octave. And ſo on to a third ſeries.

Theſe are the compound concords.

All other proportions ſounded together are harſh and diſagreeable to the ear; and are for this reaſon called diſcords.

From the compounding and dividing the proportions delivered, not only the harmonical intervals are computed, but the diſcords likewiſe.

And this the following calculations demonſtrate.

The proportion of the octave is the proportion of the 4th and 5th: for, by compounding $\frac{4}{3}\ \frac{3}{2} = \frac{12}{6}$, or $\frac{2}{1}$ the proportion of the octave.

Again, it is the proportion of the ſharp 3d and flat 6th; for, $\frac{5}{4}\ \frac{8}{5}\ \frac{40}{20} = \frac{320}{160}\ \frac{10}{5}\ \frac{2}{1}$ in its loweſt terms.

Again, the flat 3d and ſharp 6th: for, $\frac{6}{5}\ \frac{5}{3} = \frac{30}{15}$ or $\frac{2}{1}$ the proportion of the octave.

Now, ſince the 4th and 5th, the 3d and 6th, as alſo the 2d and 7th, compounded, make the octave; that is, any two numbers making 9, the middle term or note being repeated, or common to both; it follows, that to fall a 4th or riſe a 5th, as alſo to fall a 3d or riſe a 6th, and to fall a 2d or riſe a 7th, and the contrary, anſwers the ſame purpoſe of harmony; for they meet in the octave.

This obſervation will be of great uſe in ſetting the baſs, and figuring the ſame, by producing that variety and contrary motion demonſtrated neceſſary in the 4th axiom.

Proportion of the 5th.

The proportion of the 5th is the proportion of the ſharp 3d and flat 3d; for by compounding $\frac{5}{4}\ \frac{6}{5} = \frac{30}{20}$ or $\frac{3}{2}$ the ſeſquialteral and known proportion of the 5th.

Proportion of the Sharp 6th.

The proportion of the ſharp 6th is the compound proportions of the fourth and ſharp 3d; for $\frac{4}{3}\ \frac{5}{4} = \frac{20}{12}$, or $\frac{5}{3}$. Of the flat 6th, the proportion is of the 4th and flat 3d; for $\frac{4}{3}\ \frac{6}{5} = \frac{24}{15}$ or $\frac{8}{5}$.

By the ſame manner of compounding are found the proportions of the concords of the 3ds; which ſhall be ſhewn when we ſhall have got the tones and ſemitones; which, as being diſcords, ariſe by dividing the harmonic proportions as follows.

Proportions *of the* Discords *proved.*

Proportion of the Greater Tone.

The proportion of the greater tone is the difference of the 4th and 5th; for $\frac{4}{3}) \frac{3}{2} (= \frac{9}{8}$ the proportion of the greater tone.

Proportion of the Leſſer Tone.

The proportion of the leſſer tone is the difference of the 5th and ſharp 6th; for $\frac{3}{2}) \frac{5}{3} = \frac{15}{9}$ the proportion of the leſſer tone.

Proportion of the Semitone.

The proportion of the ſemitone is the difference of the ſharp 3d and 4th; for $\frac{5}{4}) \frac{4}{3} = \frac{16}{15}$ the proportion of the ſemitone.

Having now the propprtions of the tones and ſemitones, we are enabled to prove the proportion of the ſemitone, or flat 2d and ſharp 7th to the 8th; as likewiſe all the remaining proportions, whether diſcord or concord: For, the 5th and ſharp 3d, $\frac{3}{2}\ \frac{5}{4}$, give $\frac{15}{8}$ the greater 7th; and the ſharp 9th and ſemitone $\frac{15}{8}\ \frac{16}{15} = \frac{240}{120}$ in its loweſt terms $\frac{2}{1}$ the proportion of the octave.

To go on; The proportion of the ſharp 3d is that of the greater

greater and leſſer tones; for, $\frac{8}{9}$ $\frac{10}{9}$ — $\frac{80}{72}$ $\frac{10}{24}$ $\frac{15}{15}$ $\frac{8}{4}$ in its loweſt terms, the greater 3d.

And the proportion of the flat 3d is compounded of the greater tone and ſemitone; for, $\frac{8}{9}$ $\frac{16}{15}$ — $\frac{144}{120}$ $\frac{48}{40}$ in its loweſt terms $\frac{6}{5}$ the proportion of the flat 3d.

The proportion of the 4th is that of the ſharp 3d and ſemitone; for, $\frac{5}{4}$ $\frac{16}{15}$ — $\frac{80}{60}$ in its loweſt terms the proportion $\frac{4}{3}$ of the 4th. Or it is the proportions of the flat 3d and leſſer tone; for, $\frac{6}{5}$ $\frac{10}{9}$ — $\frac{60}{45}$ $\frac{12}{9}$ in its loweſt terms $\frac{4}{3}$.

The proportion of the diſcord of the ſharp 4th is found by compounding its conſtituent intervals, the 4th and ſemitone; for, $\frac{4}{3}$ $\frac{16}{15}$ — $\frac{64}{45}$ the proportion of the ſharp 4th.

And laſtly, the proportion of the flat 7th is compounded of two 4ths, or is $\frac{16}{9}$; for, $\frac{4}{3}$ $\frac{4}{3}$ — $\frac{16}{9}$ the proportion of the flat 7th.

Theſe proportions, in the natural order of the firſt ſeries, or ſharp key, ſtand thus:

K	2d	Sharp 3d	4th	5th	Sharp 6th	Sharp 7th	8th
1	$\frac{9}{8}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{15}{8}$	$\frac{16}{8}$ — $\frac{2}{1}$

In the ſecond ſeries, or flat key, thus:

K	2d	Flat 3d	4th	5th	Flat 6th	Flat 7th	8th
1	$\frac{9}{8}$	$\frac{6}{5}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{8}{5}$	$\frac{10}{9}$	$\frac{2}{1}$

Hence we can demonſtrate (what before was taken for granted) the places of the greater and leſſer tones, and ſemitone.

Now, the relative proportion or difference is found by diviſion of the two next proportions in the natural order as above.

The places of the greater and leſſer tones and ſemitones in the ſharp key.

1) $\frac{9}{8}$ ($\frac{9}{8}$ the greater tone, or 2d.

$\frac{9}{8}$) $\frac{5}{4}$ ($\frac{40}{36}$ in its loweſt terms $\frac{10}{9}$ the leſſer tone, or ſharp 3d.

$\frac{5}{4}$) $\frac{4}{3}$ ($\frac{16}{15}$ the ſemitone, or 4th.

$\frac{4}{3}$) $\frac{3}{2}$ ($\frac{9}{8}$ the greater tone, or 5th.

$\frac{3}{2}$) $\frac{5}{3}$ ($\frac{10}{9}$ the leſſer tone, or ſharp 6th.

$\frac{5}{3}$) $\frac{15}{8}$ ($\frac{45}{40}$ or $\frac{9}{8}$ the greater tone, or ſharp 7th.

$\frac{15}{8}$) $\frac{2}{1}$ ($\frac{16}{15}$ the ſemitone, or 8th.

The places of the greater and leſſer tones and ſemitones in the flat key.

1) $\frac{9}{8}$ ($\frac{9}{8}$ the greater tone, or 2d.

$\frac{9}{8}$) $\frac{6}{5}$ ($\frac{48}{45}$ — $\frac{16}{15}$ the ſemitone, or flat 3d.

$\frac{6}{5}$) $\frac{4}{3}$ ($\frac{20}{18}$ — $\frac{10}{9}$ the leſſer tone, or 4th.

$\frac{4}{3}$) $\frac{3}{2}$ ($\frac{9}{8}$ the greater tone, or 5th.

$\frac{3}{2}$) $\frac{8}{5}$ ($\frac{16}{15}$ the ſemitone, or flat 6th.

$\frac{8}{5}$) $\frac{16}{9}$ ($\frac{80}{72}$ — $\frac{10}{9}$ the leſſer tone, or flat 7th.

$\frac{16}{9}$) $\frac{2}{1}$ ($\frac{18}{16}$ — $\frac{9}{8}$ the greater tone, or 8th.

The uſe of this theory is chiefly on account of aſcertaining the places of the ſemitone; the difference of the major and minor tones, which is as $\frac{81}{80}$, having not been hitherto reduced to practice.

We ſhall therefore hereafter admit no other diſtinction than that of whole and half tones.

The intervals then contained in the octave, in both keys, excluding the firſt term, will be more eaſily deſcribed thus:

The —— 2d is one tone,
Flat 3d a tone and a half.
Sharp 3d two tones.
4th two tones and a half.
Sharp 4th three tones.
5th three tones and a half.
Flat 6th four tones.
Sharp 6th four tones and a half.
Flat 7th five tones.
Sharp 7th five tones and a half.
8th ſix tones.

Having found all the intervals, their order and proportions; it will be neceſſary to take in one view the ſemitones of the octave, marked by their different names and intervals. For every ſemitone hath two names in reſpect to the preceding and following note in the natural order. As in the following example. The knowledge of this is moſt neceſſary to learning the art of compoſition. N° 7.

The diſcords being, as hath been ſhewn, the leſſer 2d, or ſemitone, and greater 2d, the ſharp 4th or falſe 5th, the leſſer and greater 7ths, it is to be underſtood, that not any two or three of theſe are to be ſounded together, to frame the diſcord; as the members of any concord are, to make the harmony: but each diſcordant note hath its diſcordant and concordant notes proper to itſelf, which fill up the diſcord; and which are called the accompaniments.

The five diſcords, then, being diſtinct and unlike each other; the definition of diſcord muſt be this:

Diſcord conſiſts in certain variable proportions of the diſtance of ſounds, performed at the ſame inſtant of time, and diſagreeable to the ear.

Chap. II. Of the SCALE of MUSICK.

Having found that the larger combinations of the 13 ſemitones in the octave conſtitute the concords and diſcords; for the better application of them to our purpoſe, we ſhall next conſider them ſingly and diſtinctly.

Diapaſon — — —	Octave — 8th.
Semidiapaſon Defective 8th, or — — Sept. major	greater ſharp 7th.
Sept. minor — — —	leſſer flat 7th.
Hexachordon major — — —	greater ſharp 6th.
Hexachordon minor — —	leſſer flat 6th.
Diapente — — — — —	5th.
Semidiapente, or — — — Tritone	— ſharp 4th, or falſe 5th.
Diateſſaron — — — — — —	4th,
Ditone — — — — —	greater, or ſharp 3d.
Semiditone — — —	leſſer, or flat 3d.
Tone — — — — —	greater — — 2d.
Semitone — — — — —	leſſer — — 2d.
Uniſon — — — — —	one ſound.

As they ſucceed each other in the natural order of both keys, as above demonſtrated; this is called the ſcale of muſick.

In this ſcale we ſhall likewiſe take a view of the concords of the ſame denomination, as they ariſe in ſucceſſion from the ſame natural order of the ſimple tones, and alſo of the diſcords as oft as they occur.

There are two ſcales in uſe: the diatonic ſcale, and the chromatic.

In the diatonic ſcale, the notes ariſe by two tones, a ſemitone,

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ſemitone, and one tone to the 5th; and thence by two tones and a ſemitone to the 8th. This is the order in a ſharp key; where note, that the ſemitones are in the 4th and 8th places. No. 8.

In a flat key, the notes aſcend according to the following example. N° 9.

One tone, a ſemitone, and two tones to the 5th; a ſemitone and two tones to the 8th.

In the next example, the ſame proportion of the flat third is illuſtrated by compariſon with the inſtance in the ſharp key. No. 10.

The number of the tones and ſemitones in both flat and ſharp key are equal. The difference ariſes from the places of the ſemitone: which, in the flat key, are the 3d and 6th. This is that eſſential difference of tune already mentioned, which creates ſuch variety in muſical ſtrains, as well as in the harmony. Theſe are ſome effects of the ſemitone; others we ſhall ſee in its proper place.

The Chromatic Scale.

The chromatic riſes by a tone and 5 ſemitones to the 5th, and thence by 5 ſemitones more to the 8th. Thus No. 11.

The chromatic ſcale, which is no other than the natural ſemitones in their order, except the firſt tone, is only uſed when mixed with the diatonic. That is to ſay, when a ſemitone, not belonging to the harmony of the key, is introduced in the middle of a tune. And this may be done by the note aſcending by a ſemitone, or deſcending: in either of which caſes, the key is changed in that part of the ſtrain. This is the cauſe of great variety in the air; as well as it new-modulates the harmony. This is another effect of the ſemitone, on which turns ſo much variety and elegance. It muſt be executed by the compoſer with all the addreſs and art imaginable. For this we muſt refer to the ſecond part or practice; where will be given the rules for the mixture of the chromatic. Pieces of muſick where it is frequently uſed, are now commonly called chromatic muſick.

The diatonic ſcale being that which we are chiefly concerned to underſtand, as well as the firſt in order, and before any uſe of the chromatic can take place; we ſhall proceed to view it in another light, whereby we ſhall diſcover ſuch properties of it as will be uſeful to the compoſer. Sharp key. No. 12.

From the key the thirds aſcend, as in the above example, by one ſharp 3d, two flat 3ds, two ſharp 3ds, a flat 3d, and laſtly another flat 3d on the 2d to the key.

All the 4ths being perfect, are like; except that one which falls on the ſharp 7th; this is called a ſharp 4th, or falſe 5th. No 13.

All the 5ths are perfect, and therefore like; except that formed by the ſharp 7th and 4th, which likewiſe is a flat 5th or ſharp 4th No. 14.

The 6ths ſtand thus: two ſharp 6ths, one flat 6th, two ſharp 6ths, two flat 6ths No. 15.

There are but two greater 7ths which are the ſharp 3d and ſharp 7th to the key: they ſtand under the two ſemitones.

All the 8ths are perfect and alike.

From theſe theorems, and axioms, the 2d and 4th, we deduce this practical corollary.

Cor. IV. The 3ds and 6ths are the intervals moſt frequently to be uſed in compoſition; the 8ths, 5ths, and 4ths moſt rarely.

The 4th being an improper concord, and the 7th a diſcord; we cannot aſcertain their uſe till we come to the demonſtration of the harmony and accompaniments of the diſcords in the 2d part.

On this 4th corollary is grounded the reaſon of forbidding two 8ths and two 5ths in conſecution, either in compoſition, or performing thorough baſs.

Next follow examples of the ſame in a flat key. No. 16, 17, 18, 19.

There are but two ſharp 7ths which are the 2d and 5th to the key. They ſtand under the ſemitones.

All the octaves are perfect and alike.

It is evident to ſight, that the intervals in the flat and ſharp key do not in the leaſt vary; except in the order they ſucceed each other, beginning from the key. And it is equally evident, that this variation is owing to the different places of the ſemitone.

This demonſtrates what has been ſaid in page 319. col. 1. concerning the ſemitone; and illuſtrates what is aſſerted in the 4th axiom, that variety, amidſt uniformity, muſt be the great object attended to in muſick, ſince that uniformity and variety both ſubſiſt in the very principles.

Let it be obſerved, that this uniformity is preſerved by bringing in the flat 6th and flat 7th to the key. And this muſt of neceſſity be ſo, ſince they are the places of the ſemitone and leſſer tone in the natural flat key wherein the example is ſet, according to the demonſtration of the ſame.

For, by corollary 1. nothing can be admitted in compoſition which doth not immediately depend on the 2d axiom, and which cannot be demonſtrated from it; namely, that the proportions of ſounds, and their relations, muſt be deduced from the natural order of the notes. This is the true reaſon for introducing the flat 6th and flat 7th in every flat key.

The harmonic proportions and diſcords having been demonſtrated from the diviſion of a line in arithmetical progreſſion; we ſhall, in the next place, try what are the effects of a muſical ſtring divided in geometrical proportion. No. 20.

Let A B, a muſical ſtring, be divided equally in C; C B, the half next the bridge, will ſound an octave to the whole or open ſtring, as we have ſhewn in the harmonic proportions.

Again, let C B be equally divided in D; D B will ſound the octave to C B, or double octave to the open ſtring. A B.

And thus, by an equal diviſion of a ſtring between either the nut and bridge, or ſtop and bridge; the half next the bridge will give the octave above continually.

But the ſame proportion is not preſerved in the equal diviſion between the nut and ſtop, or between any two ſtops. For the length of the octave to the open ſtring, which is between the nut and ſtop, being equally divided; the half next the nut gives the ſound of the 4th to the open ſtring; and the half next the ſtop, or bridge,

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ſounds the 5th, which two are the conſtituent intervals of the octave.

And the ſame diviſion of the ſounds is conſtantly preſerved, if the length of an octave be equally divided between any two ſtops.

Again, the length of a 5th between two ſtops, or nut and ſtop, equally divided; the half next the bridge gives the greater 3d, the other half the leſſer 3d.

And again, the length of the greater 3d, thus divided, gives the greater and leſſer tone. And the greater tone's length, equally divided, gives the greater and leſſer ſemitone. And the length of the greater ſemitone, equally divided, gives the ſounds in proportion as 5 and 4. The greater interval being next the bridge, and ſo continually.

Hence the neceſſity of the greater and leſſer tones and ſemitones in muſic is evident; and the truth confirmed, which is aſſerted in the 2d corollary.

Now, in the diatonic ſcale, whereſoever the ſemitones lie, that is, whether the air be in a flat or ſharp key, the graver part of the tone will be the leſſer ſemitone, and the acuter the great ſemitone; and in the chromatic, which aſcends by ſemitones, the greater and leſſer ſemitones will, for the ſame reaſon, ſucceed each other alternately. Wherefore, if any ſeries of chromatic notes be removed a ſemitone higher or lower; it muſt happen, that the leſſer ſemitone will ſucceed into the place of the greater, and the greater into the place of the leſſer. Hence diſſonances will happen in the diatonic ſcale, as being compoſed of the ſame materials with the chromatic, if the key be injudiciouſly changed by tranſpoſition. For, as the diſſonance will be evident, if the tranſpoſition be by one ſemitone; ſo the diſproportion will ſtill appear, if the removal be by any odd number of ſemitones within the compaſs of the 4th.

As the proportions of the concords have been demonſtrated from the diviſion of a line; ſo are they likewiſe to be found in the geometrical proportions of ſolid bodies, and therefore may be illuſtrated by the ſame.

We ſhall begin with the proportion of the 8th.

The proportion of the 8th being the compound proportions of the 5th and 4th, is, by corollary of the 34th propoſition of Archimedes, as the whole ſuperficies of a right cylinder deſcribed about a ſphere, to the whole ſuperficies of an equilateral cylinder inſcribed as 2 to 1. For, the circumſcribed is to the ſpheric ſuperficies as 12 is to 8 (by 32 of this,) but the ſpheric is to the inſcribed as 8 is to 6 by this preſent propoſition: therefore the circumſcribed is to the inſcribed as 12 is to 6, or 2 to 1.

In harmonic terms thus expreſſed: the 5th is to a given note or key as 12 is to 8; but the proportion of the 4th is as 8 to 6. Therefore, the proportion of the 8th is $\frac{12}{6}$ $\frac{8}{6}$ as 2 to 1.

Again, the proportion of the 5th, and the next harmonical proportion ariſing out of the 5th, is beautifully illuſtrated in the admirable proportion of the ſphere, right cylinder, and equilateral cone circumſcribed about each other. The laſt proportion being invented by Andrew Facquet; and that of the two firſt by Archimedes, as demonſtrated in his 45th propoſition in Tacquet's Euclid.

We cannot forbear tranſcribing at length this wonderful propoſition, and demonſtration of the ſame; for that on this proportion is erected the whole ſuperſtructure of harmonic chords.

ARCHIMEDES's PROPOSITION 45.

THEOREM. An equilateral cone circumſcribed about a ſphere, and a right cylinder in like manner circumſcribed about the ſame ſphere, and the ſame ſphere itſelf continue the ſame proportion, to wit, the ſeſquialteral, as well in reſpect of the ſolidity, as of the whole ſuperficies. For, by 32d of this book, the right cylinder ( ) encompaſſing the ſphere, is to the ſphere, as well in reſpect of ſolidity, as of the whole ſuperficies, as 3 is to 2, or as 6 to 4. But by the foregoing, the equilateral cone circumſcribed about the ſphere, is to the ſphere, in both the ſaid reſpects, as 9 to 4. Therefore, the ſame cone is to the cylinder, both in reſpect of ſolidity and ſurface, as 9 is to 6. Wherefore, theſe three bodies, a cone, cylinder, and ſphere, are, betwixt themſelves, as the numbers 9, 6 and 4, and conſequently continue the ſeſquialteral proportion, Q. E, D.

In harmonic terms expreſſed thus: the 5th is to the key as 3 is to 2, or as 6 to 4: but the 9th is to the key, (that is, the 5th to the 5th) as 9 is to 4; (for the 2d and its 8th $\frac{3}{1}$—$\frac{9}{4}$:) therefore, the ſame 9th is to the 5th as 9 is to 6. Wherefore theſe three tones, the 9th, the 5th, and the key, are, betwixt themſelves, as the numbers 9, 6, and 4; and conſequently continue the ſeſquialteral proportion, Q. E, D.

Therefore, the proportions of the key, the 5th and its 5th, being the ſame ſeſquialteral proportion continued, are the ſame proportions as that of the equilateral cone, right cylinder and ſphere; the two firſt deſcribed about the ſphere, Q. E, D.

On the proportion of theſe three is erected every other proportion of harmony; which we ſhall purſue one ſtep further, foraſmuch as theſe truths will be moſt manifeſt and eſtabliſhed in the practice when we ſhall have delivered the rules of harmony.

The 5th divided arithmetically, or equally, gives, as hath been ſhewn, the greater 3d or next perfect concord: the ſeſquialteral proportion to which gives the greater 7th; for $\frac{1}{4}$ $\frac{1}{4}$ gives $\frac{1}{8}$ the greater 7th, as demonſtrated above.

Hence, from the ſeſquialteral proportion thrice repeated, namely, to the key, its 5th and 3d, we are furniſhed with the perfect harmony, or concords of the key and 5th; to which every harmonic proportion, where-ever found, is analogous; that is, partaking of the nature, proportion, and relation of the key and its 5th. It is worth remarking in this place, that the members of theſe chords ariſe out of the proportions, as above demonſtrated, by turns. The key being firſt ſupplied with one proportion; and then in its turn the 5th with the ſame. Wherefore, the mixture of the harmony of the key and 5th is ſcarcely ſeparable: A truth which will abundantly diſcover itſelf in the practice, both in the rules of harmony, and in every other part of compoſition. On this is founded the following axiom.

AXIOM

Axiom VI. These 5 tones therefore, namely, the key, the 3d, 5th, sharp 7th and 9th, are the foundation of the whole superstructure of musick.

We shall conclude this theory with the harmonical division of a line.

To divide a Line harmonically. No. 21.

A right line, A D, is said to be divided harmonically, if, being cut into three parts, A B, B C, C D, the case be so, that, as the whole A D (or Z) is to either extreme a or c:: so shall the other extreme be to the indeterminate part m; that is,

$Z : a :: c : m$
$Z : c :: a : m$ } Wherefore $Z\ m - a\ c$.

And, to divide any given right line thus harmonically, as suppose A D: From either end of it draw a right line, as D G; make an angle with it, and of any length; connect the end of this line with the other end A, by drawing A G; and then taking any point, as B, at pleasure, in the given line, there draw E F parallel to D G, and in it take B E equal to B F; then draw E G, and that shall find the point C required: and then calling, as above, the whole line Z, A B $-$ a, B C $-$ m, and D C $-$ c, I say $Z : a :: c : m$.

For the triangles A D G, A B F, and B E C, are all similar; and consequently A D : A B :: D G : B F:: or as D G: to B F $-$ B E. But as D G: B E: C D: B C; (by working about the equal angles D and E, B C) wherefore, by equality, A D: A B:: C D: C B; that is, $Z : a :: c : m$. Q. E. D.

And from hence it is plain, that the ratio of the whole line A D, to the segment A B, may be taken at pleasure; but that the intermediate part B C must be less than either A B or C D.

PART II. THE PRACTICE OF MUSICK.

THE practice of musick is founded on the principles delivered in the theory. Its several parts are, composition, figuring the bass, melody, transposition, and singing by note.

Of these we shall treat separately in the above order.

Composition is the setting together two or more notes in harmony, to be sounded at the same time.

When in the succession of concords, in the parts, the notes of each part are of the same length, or time of sounding, the composition is called counterpoint.

When the succession of concords is by notes of different lengths in the several parts, it is called plain descant.

The mixture of discord and concord, by notes of the same or different lengths or time in the parts, is called figurate descant. Of these in their order: and first of counterpoint.

In order to attain more easily the art of composition, it is necessary to premise a few things concerning other affections of sounds; as the time or lengths of sounding the notes; the time of musick, or movement of the air; and the different cliffs wherein the parts of musick are usually written.

The following account of the proportions of the lengths of notes, the time and cliffs, being well understood by every one acquainted ever so little with musick, might well have been omitted in an essay of this kind; (where, instead of using repetitions, it is hoped we have offered to the public something new; at least in the manner of demonstrating the rules of composition, both in discord and harmony;) but that we would leave nothing in our power untold, which may contribute to form a compleat musician.

The longest note, now generally in use in instrumental musick, is called a semibreve. Its time is as long as you can distinctly count for.

Out of the division and subdivision of the semibreve are formed the lengths of all other notes; according to the following proportions. No. 22.

A semibreve, whose time is as one, two, three, four, is as long

as { 2 Minums, 4 Crotchets 8 Quavers, 16 Semiquavers. 32 Demisemiquavers.

A dot after any note, signifies the time of such note must be lengthened to one half of the plain note. No. 23.

The proportions are thus;

A dotted semibreve is equal to 3 minums.
A dotted minum to 3 crotchets.
A dotted crotchet to 3 quavers.
And so of the rest.

Thus we are furnished with notes according to the odd and even numbers. And this naturally divides the time of any song or music into odd and even time.

COMMON TIME.

When the air moves according to the even numbers; and every bar is measured by beating the time into two equal and even parts, the musick is composed in common time: known by one of the following marks prefixed to the tune; as the letter C, having 4 crotchets in a bar; or $\frac{2}{4}$, denoting two crotchets in a bar.

TRIPLE TIME.

But when the musick moves according to the odd numbers, and every bar is measured by beating the time into two unequal parts, as two and one, the song is composed in triple time; which is known by one of these signs prefixed to the tune.

3, or $\frac{1}{1}$, for 3 minums in a bar.
$\frac{3}{4}$ 3 Crotchets in a bar.
$\frac{3}{8}$ 3 Quavers in a bar.
$\frac{9}{4}$ 9 Crotchets in a bar.
$\frac{9}{8}$ 9 Quavers in a bar.

The uppermost number being the numerator of a vulgar fraction; and the lower, or denominator, the aliquot part of the semibreve.

There is also another proportion of the length of notes in use. And this is, when three quavers are, by diminution

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nution of their lengths, contracted into the time of 2 quavers, or one crotchet, conſtantly noted by the figure (3) over them.

And laſtly, the moſt common movement of jiggs, which is by ſix or twelve quavers in a bar, have their baſs, for the ſmoothneſs of the movement, often written in plain crotchets; 2 in a bar for the treble $\frac{6}{8}$; and four, marked thus C, for the treble $\frac{12}{8}$. It is plain, therefore, that all tunes in theſe movements truly belong to common time, ſince every bar is meaſured by the beating, or dividing it into even parts, as expreſſed in the baſs.

A pauſe or reſt in muſick, is a ceſſation of the ſound, in one or more of the parts; or of all the parts together. Nothing hath a finer effect in muſick than a pauſe of all the parts judiciouſly made; or of one, or more of the parts, for the ſake of imitation. The reſts therefore are written down in the place of notes, and each note hath its own reſt, which is of the ſame length with the note whoſe name it bears. Thus,

A ſemibreve reſt is as long as a ſemibreve.

A minum reſt as long as a minum.

And ſo of the reſt.

The next thing to be conſidered is the cliff in which any part of the muſick is ſaid to be written; according as the cliff is prefixed to each ſtave of the writing.

The uſe of the cliff is to aſcertain the names of the notes; and to denominate that part of the muſick to which it is prefixed.

There are three cliffs, to anſwer and diſtinguiſh the three parts in muſick: The baſs, or F cliff; the tenor, or C cliff; and the treble, or G cliff. No. 24.

The baſs is ſo called, from its being the loweſt part, or that wherein are ſet the graver tones.

The tenor, or middle part, hath its name from holding the baſs and upper parts together. This will be clearly underſtood, when we ſhall have learned to compoſe in four parts.

The uppermoſt part is called the counter-tenor in vocal muſick: and, in inſtrumental, the firſt treble.

The baſs and treble cliffs are now conſtantly written in the ſame places as in the examples. The tenor cliff is often removed, according to the fancy of the compoſer or writer of muſick; to anſwer the convenience of the notes ſtanding, as much as may be, within the compaſs of the five lines, or ſtave. Which convenience is the reaſon for the invention of the diverſity of cliffs, as well as the uſes already named. For it is eaſy to apprehend, that the natural tones, and their proportions, are invariably the ſame, whether expreſſed by the voice, or an inſtrument, however they may be diſtinguiſhed by artificial ſigns. Obſerve, that the cliffs, according to their names, riſe above each other by the interval of a 5th: thus the tenor is equally diſtant from each other part. For C is a 5th to F, as it is alſo a 5th below G.

Chap. I. Of COMPOSITION in COUNTERPOINT.

Compoſition in counterpoint is when, in the ſucceſſion of concords in the parts, the notes of each part are of the ſame length, or time of ſounding.

According to the 2d axiom, we ſhall begin with the harmony of the key note; and proceed to demonſtrate the harmony of the remaining notes of the octave in their natural order.

Demonſtration of the harmony of the key.

The harmony of the key is the concord of itſelf.

The harmony of the key muſt be perfect harmony. Now, the notes concording in perfect harmony, are, by corollary 3d, the 3d, 5th, and 8th: But theſe, with the key, are the concord of itſelf: Therefore, the harmony of the key is the concord of itſelf.

This demonſtration is grounded on this evident truth; namely, that any other concord would, by the term, or name of it, in effect change the key; whereby the unity of the tune would be deſtroyed, and by this contradiction the author's meaning rendered unintelligible. The neceſſity of perfect harmony in the key being evident, no other ſort of demonſtration is required, nor indeed can be admitted.

Prob. Let it be required to ſet a baſs to the notes of an octave aſcending in G ſharp. No 25.

Any one of the three notes in the baſs is concording, by corollary 3; but the 8th is preferable when it is the firſt or laſt note of the tune; for thus it beſt aſcertains the key. The preference of either of the other two depends on the following rules.

Firſt, The 5th cannot take place when the concord immediately preceding ſhall happen to be a 5th, the forbidding the conſecution of 5ths being aſſerted in corollary the 4th.

Again, the movement of the baſs ought generally to be by deſcending a 5th, or riſing a 4th, 6th, or 8th, or any other great interval; thereby meeting the treble, and effecting variety and contrary motion of the parts; the eſtabliſhed rules of harmony by the 4th axiom.

Laſtly, The air of the baſs muſt be conſulted; and, if poſſible, an imitation of ſome foregoing paſſage in the upper part.

The application of theſe rules will decide which of the two or three notes is preferable in this or any other concord.

Demonſtration of the harmony of the 2d.

The harmony of the 2d is the concord of the 5th.

The harmony of the key having been ſhewn, we muſt conſider it as an immoveable point, in relation to which we are to order the reſt of our computations, conſiſtent with the eſtabliſhed principle of uniformity.

The 2d to the key immediately deſcending into the key, will have, for its next concording note, the greater 7th; which at the ſame time aſcends by a ſemitone into the key; to which 7th the 2d is a 3d.

For, by axiom 2. the combination of ſounds are deduced from the natural order of notes aſcending and deſcending. But the 2d and 7th can admit no other concordant note but the 5th to the key. For the 3d is diſcord with the 2d; and the 4th, 6th, and 8th diſcord with the ſharp 7th.

Now, the 2d, 7th, and 5th are the concord of the 5th; therefore, the harmony of the 2d is the concord of the 5th. No. 26.

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The 5th muſt always be taken at the cloſe; or when the treble is deſcending into the key; for then the baſs will fall a 5th into the key; which movement is called the great cadence. Otherwiſe the 7th or 5th may be taken indiſcriminately; yet, under the reſtriction of the rules, (p. 326. col. 2.) for ſetting the harmony of the key.

Demonſtration of the harmony of the 3d.

The harmony of the 3d is the concord of the key.

From the demonſtration of the harmony of the key, the key will have its 3d; and, by inverting, the 3d will have the key. Now, the key and its 3d will admit no other concordant note but its 5th: For the 2d is diſcord to both, the 4th is diſcord to the 3d, and the 7th diſcord to the key; but the key, its 3d and 5th, are the concord of the key. Therefore, the harmony of the 3d is the concord of the key.

The 6th indeed, which is a 4th to the 3d, which is an improper concord, will, with the key, form the concord of the 6th; but the demonſtration of the concord of the 6th in a ſharp key, depending on another priuciple, as will be ſhewn in its place, can, for the ſame reaſon, bear no relation to the harmony of the 3d, which is a member of the key. No. 27.

The two notes in the baſs may be taken indiſcriminately; yet complying with the rules, (p. 326. col. 2.) But, if the 3d in the treble be prepared to deſcend into the key, by its paſſage into the 2d, then the 5th is more eligible; which falling an 8th for the next note, thence deſcends by a 5th into the key. This is the moſt ſtriking movement of the baſs; and, at the ſame time, the moſt common, at a final cloſe in either flat or ſharp key.

Demonſtration of the harmony of the 4th.

The harmony of the 4th is the concord of itſelf.

In a ſharp key, the places of the two greater 7ths are the ſharp 3d and ſharp 7th to the key: and, of the ſemitones, the 4th and 8th, or key; Therefore, the 3d is to the 4th as the ſharp 7th to the key. Now, ſince by axiom 2d, the combinations are deduced from the natural order of the notes aſcending and deſcending; the harmony of the 4th will be as the harmony of the key: But the harmony of the key is (by demonſtration 1.) the concord of itſelf: therefore, the harmony of the 4th is the concord of itſelf. No. 28.

The notes in the baſs may be taken indiſcriminately: only obſerving the foregoing rules. If a cloſe on the 4th be prepared from the 4th itſelf, either note will do: yet the key is preferable, in order to prepare for the great cadence.

Demonſtration of the harmony of the 5th.

The harmony of the 5th is the concord of the key.

From the demonſtration of the harmony of the key, the key will have its 5th; and, by inverting, the 5th will have the key. Now, the key and its 5th will admit no other concordant note than the 3d. For, the 2d and 4th are diſcord with the key and 5th; the 6th diſcord with the 5th; and the 7th diſcord with the key. But the key, its 5th and 3d, are the concord of the key: therefore, the harmony of the 5th is the concord of the key. No. 29.

There is no exception in the choice of the baſs notes; but the diſallowance of the conſecution of 5ths. But if there be a preparation for a cloſe on the key, and the 5th ſtand in the baſs; in order to make the great cadence, the 5th will have its own concord. This depends on the demonſtration of the 2d.

Demonſtration of the harmony of the 6th.

The harmony of the 6th is the concord of the 4th.

From the demonſtration of the 4th, its harmony is its own concord. The 4th, then, will have its 3d; and, by inverting its 3d (that is, the 6th) will have the 4th. Now, the 4th and 6th will admit no other concordant notet han the 8th: For the 2d is, (with the 4th and 6th,) a diſcord, as will be ſhewn in the demonſtration of the diſcords. The 3d and 5th are diſcord to the 4th, and the 7th to the 6th. But the 4th, 6th, and 8th, are the concord of the 4th: therefore, the harmony of the 6th is the concord of the 4th. No. 30.

Either note in the baſs may be taken at will. But if there be a preparation for a cloſe on the 4th, the ſecond note, or key, is preferable, for the reaſons aſſigned in the demonſtrarion of the 4th, which is, to make the great cadence, prepared by the baſs, firſt deſcending an 8th, and thence a 5th, into the 4th, or cloſe.

Demonſtration of the harmony of the 7th.

The harmony of the 7th is the concord of the 5th.

The harmony of the 7th is part of the harmony of the 2d, (by demonſtration 2.) but the harmony of the 2d is the concord of the 5th: therefore the harmony of the 7th is the concord of the 5th. No. 31.

If the 7th, or treble note, precede a cloſe on the key, the firſt note in the example muſt be the baſs note, in order to make the great cadence.

The 8th being the key, hath for harmony its own concord; as by demonſtration 1.

From the foregoing demonſtrations, the baſs notes, ſet to the 8 aſcending notes in the treble, will ſtand thus.

General Rule. The conſecution of 8ths, 5ths, and 4ths, is not allowed, (as by corollary 4.) except by contrary motion of the parts, or in the paſſage of very quick notes in compoſition of many parts. No. 32.

From taking in one view the harmony of the ſeven notes, we ſhall deduce ſome uſeful corollaries. No. 33.

Key	2d,	3d,	4th,	5th,	6th,	7th,
			hath the harmony of the			
Key	5th,	Key	4th, Key	and 5th,	4th,	5th,
		Semitone.		Semitone.		

Cor. I. Every note in the octave (except the 2d to the key) admits in its harmony a 3d.

Cor. II. The key, the 2d and 5th, admit in their harmony a 4th.

Scholia.

When the key admits a 4th, the concord is of the 4th.

When the 2d admits a 4th, the concord is of the 5th.

When the 5th admits a 4th, the concord is of the key.

Hence the interval of that note which admits a 4th, is in fact a 5th: therefore two 4ths are no more allowed in

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in conſecution than two 5ths. And hence likewiſe the interval of the 4th, which we have called an improper concord, appears to be of a middle nature between concord and diſcord; being a fourth in name and appearance in the natural order of ſounds; yet a 5th in name and effect in compoſition, as member of that chord wherein it makes a part of harmony.

Cor. III. The key, the 4th and 5th, admit in their harmony a 5th.

Scholia.

When the key admits a 5th, the concord is that of the key.

When the 4th admits a 5th, the chord is of the 4th.

When the 5th admits a 5th, the concord is of the 5th.

Hence, when a note admits a 5th, the harmony is the concord of the ſame note.

Cor. IV. Every note but the 4th admits a 6th; for, the 4th having its concord for harmony, will have only its 5th.

Every note admits its 8th; for any note may be ſubſtituted for its octave. But 8ths are (by corollary 4. of the theory) to be the moſt ſparingly uſed, as not producing that variety or mixture of ſounds requiſite to bind the harmony, eſpecially, where it can be beſt avoided, in the compoſition of two parts.

From the foregoing demonſtrations and corollaries, ariſe the following obſervations.

The 3ds and 6ths moſt frequently occur in compoſition. This then demonſtrates what was aſſerted, by way of precept, in the 4th corollary of the theory as well as part of the 4th axiom; namely, that the proportions of muſical ſounds, and the variety emerging from them, point out to us this variety, and will not ſuffer us to depart from the eſtabliſhed precept.

It will be neceſſary to ſee the ſame truths confirmed in the deſcending notes. We ſhall therefore ſet down inſtances of compoſition in the deſcending notes of the octave upon the ſame principles, and wherein the ſame demonſtrations and corollaries do take place.

Example of compoſition in the deſcending notes of the octave. No. 34.

In the aſcending notes, when the upper part riſes by a ſemitone, the baſs generally falls a 5th; when the upper part falls by a whole tone to a cloſe, the baſs alſo falls a 5th. This fall of the baſs, or great cadence, muſt be effected when chromatic notes are introduced aſcending; it being the property of the new ſemitone, thus formed by the note riſing a half tone, to imitate the key or cloſe. By axiom 2. the proportions of ſounds, and properties of the ſame, are deduced from the natural order of the notes. Now, by the new ſemitone introduced, the note below imitates the greater 7th to the key: therefore, in this caſe, as in a cloſe on the key, the baſs muſt fall a 5th.

Notwithſtanding, this muſt be underſtoood not of the paſſage of quick notes; and chiefly at a cloſe.

Sect. 2. *Of Compoſition in a* Flat Key.

From the difference between the flat and the ſharp key which lies in the different places of the ſemitone, there will ariſe a variety in the compoſition in a flat key, yet reſting on the principles and demonſtrations delivered in the laſt ſection.

The places of the ſemitone in the ſharp key are the 4th and 8th. In a flat key, the ſemitone ſtands in the 3d and 6th places. The variety in the compoſition will happen where the ſemitones are concerned. For, as the middle cloſe is made in the ſharp key on the 4th, which is the ſemitone; or, as the 4th in the ſharp key hath (by demonſtration of the harmony of the 4th) its own concord for harmony: ſo the middle cloſe in the flat key is made on the 3d, which is the ſemitone; or the flat 3d will have for harmony its own concord. Now, as the 4th hath its 3d and 5th for harmony, (which are the 6th and 8th of the key;) ſo the flat 3d will have its 3d and 5th, which are the 5th and 7th of the key.

Again, the flat 7th of the key being the 5th to the 3d, will, like the 5th of the ſharp key, have for harmony its own concord. This will cauſe the 2d of the key to appear as the ſharp 7th to the 3d, and the 4th of the key as a 2d (which it really is) to the 3d. Thus the whole harmony will be new modulated by the power of the ſemitone. Again, the flat 6th being the ſemitone, a middle cloſe may be made on that note; and then the ſame proportional variety ſucceeds, and new harmony, as in the former caſe.

Laſtly, at the end of the muſick, where there muſt of neceſſity be a cloſe, the flat key will have the greater 7th, like the ſharp one. Of ſo great conſequence is the ſemitone. Nor indeed can a cloſe be made at all, without the paſſage of a ſemitone in one or other of the parts. No. 35.

Differences in the flat key noted.

In the firſt example the harmony of the 2d is the concord of the flat 7th, as being 5th to the third.

The cloſe is made on the 3d, the baſs falling a 5th.

The 4th hath its own concord, as in the ſharp key.

The 5th ſtanding in an octave, may be underſtood as part of the harmony of the 3d, as the 3d to the key, in a ſharp key.

The 6th is part of the 4th's concord, as in the ſharp key; as above in the remark on the 4th.

At the cloſe, there is the ſharp 7th, from which the baſs makes the great cadence.

In this example there happen four 8ths: the firſt and laſt are abſolutely neceſſary to aſcertain the key; by the ſecond there is a cloſe made on the 3d; and that on the 5th, is for the ſake of the air in the baſs.

In the ſecond example, the harmony of the 4th is the concord of the flat 7th, as 5th to the 3d.

The harmony of the flat 6th is it own concord, being the place of the ſemitone; where the baſs riſes a 4th (the ſame as falling a 5th) as on a cloſe in the treble aſcending by the ſemitone.

In the 3d example, thoſe differences of the flat key are left out; and the notes ſet as if they were part of a ſharp key: that is to ſay, there is no cloſe made on the 3d; the 4th hath its chord for harmony; and the 6th is likewiſe part of the harmony of the 4th.

For, notwithſtanding the propriety of making a cloſe on the 3d and 6th, which are ſemitones; yet the compoſer is

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is not under the neceſſity of making a cloſe in theſe places in every paſſage; and then he is at liberty of ſetting the notes as in the example. This obſervation clearly points out the difference of compoſition in a flat key, and where it is to be practiſed.

And indeed an author, whoſe ſole end is to pleaſe the ear, will deſignedly introduce a cloſe on the flat 3d, and in as many other paſſages as he can, to create the variety ſo much deſired. In theſe caſes, the rules delivered for compoſition in the flat key muſt undoubtedly take place.

The fourth example is ſet to ſhew the movement of the baſs to the deſcending notes. The compoſition is the ſame as in the other examples.

Let us now take, in one view, the full harmony of every note in the flat key, and where the difference between it and the ſharp key lies: from which we may derive ſome uſeful corollaries. No. 36.

The harmony of the

2d,	3d,	3d,	4th,

is the concord of the

Flat 7th,	3d,	Flat 6th,	Flat 7th.

Cor. I. The 2d admits a 3d; then the concord is of the flat 7th.

Cor. II. The 3d admits a 5th; the concord is of the 3d.

Cor. III. Again, the 3d admits a 4th; then the concord is of the flat 6th.

Cor. IV. The 4th admits a 4th and 6th; the concord is the flat 7th.

By comparing theſe with the corollaries on the ſharp key, it will be evident, that each note in the flat key admits for its harmony that note which was excluded in the ſharp key. And therefore, that all harmony is divided between the flat and ſharp keys; and wonderfully diverſified by changing the places of the ſemitone.

From the demonſtration of the harmony of the 5th, with corollary 3. on the ſharp key, and the ſcholium 3. on the ſame, we gather how great a ſhare of the harmony belongs to the 5th. For it is part of the harmony of the key, and of the 2d (which chord is its own, or that of the 5th) in both flat and ſharp key: and, in the flat key, it is likewiſe in the harmony of the 3d.

The nature and properties of the ſemitone being the ſame in both keys, we can now more clearly demonſtrate the harmony of it in the following manner.

The harmony of every ſemitone is the concord of the ſame.

The key always ſtands between the greater 7th below, and the whole tone, or 2d, above. Now, by axiom 2. of the theory, the proportions, properties and relations of ſounds are deduced from the natural order of the notes aſcending and deſcending: The 4th (in a ſharp key,) the flat 3d, and flat 6th, being ſemitones, are diſtant by a half tone below, and a whole tone above, as is the key; therefore they have the ſame properties with the key. But the harmony of the key is the chord of the ſame: therefore the harmony of the ſemitone, or 4th, flat 3d, and flat 6th, is the chord of the ſame. Hence we raiſe the following axiom.

Axiom I. The harmony of every member of the concord of the key, is the concord of the key. And the harmony of every note in the compaſs of muſick, proved by the rules of harmony, is part either of the concord of the key, or of its 5th, or of a ſemitone. Hence variety in muſick is introduced by the contrary motion of the parts, and by changing the key, by bringing in new ſemitones. The better to illuſtrate this axiom, we ſhall hereafter in the examples ſet harmonical figures over every note, expreſſive of the chord.

First Example.

Let it be required to ſet a baſs to this treble in G ſharp. No. 37.

Harmony of the
Second Example. No. 38.

Harmony of the
Third Example.
In A flat, No. 39.

Fourth Example.
In G flat, No. 40.

Fifth Example.
In A flat, No. 41.

Sixth Example.
In D ſharp, No. 42.

In theſe examples every paſſage occurs which hath been delivered in the precepts of compoſition.

Take notice, that in the laſt example, the four paſſages, where the harmonic figures are not ſet over the notes, are part of a diſcord; which would take place, if the compoſition were in three parts; and which we cannot explain till we come to figurate deſcant.

Sect. 3. *Of Compoſition in* Three Parts.

The harmony, or full concord, of every note being well underſtood, both by reading the foregoing examples, as well as making application of the rules of compoſition on which the examples are framed, by trial of ſetting baſſes to other airs; the next ſtep will be to proceed to compoſition of three parts.

This requireth no other precept than thoſe already delivered, touching the harmony of each note. For the third part conſiſts of the remainining notes of each concord which have not been made uſe of in the compoſition of two parts. Yet this caution muſt be uſed, that the two upper parts ſtand in the neareſt concord to each other: that is to ſay, in 3ds as much as may be, and is conſiſtent with variety and contrary motion of them. For hereby two points will be gained: firſt, it will bind the harmony; and ſecondly, the baſs, being more at liberty to riſe and fall by greater intervals, will meet the upper parts at every point, and produce variety by his contrary motion. The following examples are the ſame ſet in two parts above.

Prob. Let it be required to ſet a baſs and ſecond part to this treble. No. 43.

Prob. Let it be required to ſet the aſcending notes of the octave in three parts, in a flat key.

In G flat, No. 44.
In A flat, No. 45.
In G flat, No. 46.

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The harmony of the ſeventh bar in the laſt example, is altered in the repetition; though the notes of the firſt treble be the ſame.

In the firſt inſtance, the concords are of the key and 5th. In the repetition, the concords are of the 3d and flat 7th.

In the firſt inſtance, the paſſage from the 5th into the key, (in the 8th bar,) being the great cadence, is juſt.

But if otherwiſe a cloſe had been made on the 3d, (in the 8th bar,) the harmony in the ſecond inſtance muſt, for the ſame reaſon, be preferred.

Hence it will be eaſy to decide in all flat keys, (to which only this caſe belongs) when the harmony of the 3d is to be part of the concord of the key, and that of the 2d the concord of the 5th; or, when the harmony of the 3d is to be its own concord, and that of the 2d or 4th part of the concord of the flat 7th.

Hence, and from corollary 1. of the theory, and from the demonſtration of the harmony of the ſemitone, we deduce this general theorem.

The trueſt harmony is produced by the whole concords taken together falling in ſucceſſion, as frequent as is conſiſtent with the approved rules of harmony, by a 5th.

We ſhall put an end to compoſition in three parts, with the following example in a flat key, being one of theſe above in two parts. No. 47.

The uſe we ſhall make of this example is to remark, that although the baſs be altered from that which is ſet in the ſame example in two parts; yet the harmony is the ſame, as is evident from the harmonic figures ſet over each.

Secondly, The 4th having its own concord, paſſes into the key, or 3d, in the paſſage of quick notes, and where there is not a cloſe. But where, on the 6th bar, a cloſe is made on the 3d, the baſs making the great cadence, the 4th in the preceding bar is part of the concord of the flat 7th. And thus the whole harmony falls a 5th.

We have altered the baſs alſo to anſwer the purpoſe of the movement of the upper parts in the cloſeſt harmony. And likewiſe to prove, that compoſition of many parts differs from that of two only. A truth which every compoſer ſhould always have in view. For it will be found, upon trial, that, when the muſick is ſet in two parts, if it be required to add a third, it will not be in the power of the compoſer to give that third part an air. A matter which ought to be ſtudied by all means; and which, t is evident from the example, can be executed, without injuring the harmony in the leaſt, by compoſing the three parts together.

We therefore recommend it to the practitioner to make himſelf perfect in the compoſition of two parts, before he engages in three; as he will thereby not only ſooner become maſter of the harmony; but alſo, by diſcovering more clearly the difference we are pointing out, will execute the compoſition of three parts with more eaſe and propriety.

Sect. 4. *Compoſition of* Four Parts.

In compoſition of 4 parts, every note in the concord is taken; or to every note there is full harmony.

The fourth part, or tenor, now to be added, conſiſts of the remaining note of the concord, which was not uſed in compoſition of three. The octave therefore will take place in the concord of every note. The conſecution of which, as well as of 5ths and 4ths, is to be avoided between the ſame parts. The rules already delivered in the compoſition of three parts muſt be attended to in this.

Example of the aſcending notes of the octave in compoſition of 4 parts. No. 48.

Second Example.

In the deſcending notes of the octave in compoſition of 4 parts. No. 49.

Third Example in 4 Parts.

In A flat, No. 50.

Fourth Example in 4 Parts.

In G flat, No. 51.

In compoſition of 4 parts, it was ſaid, that to every note there is full harmony. Notwithſtanding, in the firſt example, the ſixth notes of the firſt treble and tenor are in uniſon; each being a 6th to the baſs; ſo that the octave hath no part in that concord. This is done to avoid the conſecution of 8ths, by the ſucceeding note of the tenor, whoſe place muſt be, for the air's ſake, the 8th to the baſs, as well as to bind the harmony.

In the ſecond example, the ſeventh notes in the firſt and ſecond trebles are in uniſon; both being a 5th to the baſs. Let not this be underſtood to be a conſecution of 5ths, as they are members of the ſame chord; but is done for the ſake of the air of the ſecond treble. Let this remark ſerve for every like inſtance which may happen hereafter.

In the fifth bar of the third example, the ſecond note, the ſecond treble and tenor are in uniſon. This is done to avoid the conſecution of 4ths, which, had the tenor kept his place, would have happened from the foregoing note between the firſt treble and tenor.

In the ſame example, there is a conſecution of 5ths in the two next bars, by the tenor falling a 4th, and the baſs riſing a 5th. This ſeeming error is tolerated, ſince it is effected by contrary motion of theſe parts. For as well as it is by the contrary motion of the parts, that the conſecution of perfect concords is avoided; ſo for the ſame reaſon, the fameneſs of the harmony diſappears, or eſcapes the ear; eſpecially in compoſition of many parts.

By this reaſon, the conſecution of 4ths is prevented by the baſs riſing a 3d, according to the firſt obſervation on this example, at the 5th bar. For that would have happened by all the parts deſcending; that is, not having contrary motion. The ſecond note then of the baſs in that bar is changed from that which is ſet in the ſame example in three parts.

A few general remarks occur in this place, from comparing the compoſition of four parts with that of three.

Firſt, Whereas the perfect concords have place in ſome part of the harmony of every note in muſick of 4 parts; ſo the chances of the conſecution of 8ths and 5ths being more frequent, the more ſkill and attention will be required to avoid them.

Secondly,

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Secondly, Compoſition of 4 parts differs in many particular paſſages from that of three, though the general precepts of harmony belong to both. For, by comparing the ſame example in both caſes, there will be ſeen a variation of ſome paſſages in the lower parts. The neceſſity of complying with the eſtabliſhed precept of variety, by preventing the ſucceſſion of perfect concords, hath cauſed this alteration. See the 5th bar of the example in A flat in the three different compoſitions.

Hence ariſes a new reaſon for ſaying the compoſition of many parts differs from that of few, or two only. Therefore, in whatever number of parts the muſick is to be compoſed, one deſign muſt be firſt laid down; and to adjuſt and perfect the harmony, and to create as much variety as poſſible, the whole work muſt be planned at once, and executed agreeable to that deſign.

Laſtly, Of the tenor in particular, we have this to remark, That, whereas in compoſition of three parts, there is often a liberty left of taking any one of the concordant notes to the baſs; in four parts, the fourth or tenor coming in leaves no room for that liberty; but obliges us to a certain diſpoſition of each member of the harmony, and by this means holds together the parts, the octave every where ſounding and binding the inner notes together.

This remark on the tenor is more particularly true at almoſt every cloſe, where the tenor note is the 8th to the baſs on the laſt note but one of the cloſe; and, by keeping its place, while the baſs making the great cadence falls a 5th, the ſame tenor note becomes its 5th. Thus the two concords are held together and entire by the tenor's not removing.

Sect. 5. Compoſition of Five Parts.

The four concordant notes anſwering exactly to four parts in compoſition; when a fifth part is to be added, it is evident one note of the harmony muſt be repeated in every concord. The fifth part therefore conſiſts of the notes which are by turns repeated in each of the former, in which the avoiding the conſecution of the perfect concords is to be obſerved as before; and the air of this part attended to as far as may be conſiſtent with the rules delivered.

Example of compoſition of 5 parts in the aſcending notes of the octave. N. 52.

Second Example in 5 parts. No. 53.

The two octaves between the tenor and baſs on the ſixth and ſeventh notes of this example, are allowed; as the parts do not move into other notes, or make a new concord.

Third Example in 5 parts. No. 54.

The conſecution of 5ths between the tenor and baſs is admitted, as they meet by contrary motion of the parts.

Fourth Example in 5 parts. No. 55.

It is obſervable from theſe examples, that the moſt difficult compoſition is that of 4 parts. The other 4 parts, conſiſting of a repetition of one or more of the concordant notes of the firſt four parts, are more eaſily contrived, nothing more being required than to avoid the conſecution of the perfect concords between any two parts.

Sect. 6. Compoſition of Six Parts.

In muſick of ſix parts there is a repetition of two concordant notes. The ſixth part therefore conſiſts of the notes which take place in each of the five former, by turns.

An example or two will ſufficiently illuſtrate this.

Example of compoſition of 6 parts. No. 56.

There is a conſecution of 8ths between the fourth line and baſs, on the 3d and 4th notes; but it being the effect of contrary motion is admitted.

Second Example in 6 parts. No 57.

The two 8ths between the tenor and baſs are allowed; for, as they do not move, they are in effect but one.

Third Example in 6 parts. No. 58.

The conſecution of 8ths is by repetition of the ſame note, and therefore reckoned as one.

Fourth Example in 6 parts. No. 59.

In the 8th bar there is a conſecution of 8ths between the third part and tenor effected by contrary motion of theſe parts.

Sect. 7. Compoſition of Seven Parts.

In compoſition of ſeven parts, three notes of the harmony are repeated in each concord. The ſeventh part therefore conſiſts of the notes which are taken by turns from each of the ſix former; or, which is the ſame thing, from the firſt four; under the reſtriction of the rules concerning the conſecution of 8ths, 5ths and 4ths between any two of the parts, unleſs produced by contrary motion of the ſame, or repetition of the notes, or in the octave, as ſaid above. The ſeventh part is written in the tenor cliff, and is a ſecond tenor to the firſt; ſo that, like the upper parts, it muſt ſtand in the neareſt concord to the firſt tenor, or next part.

Firſt example of compoſition of 7 parts. No. 60.

Notwithſtanding it hath been ſaid, that three notes of the harmony are repeated in each concord in ſeven parts; yet it doth not appear in every inſtance in the example. The reaſons are, that in every cloſe, whether middle or final, it is preferable that moſt of the parts ſhould end in the concord note of the cloſe, and eſpecially of the laſt cloſe, that the harmony of the key may make the deeper impreſſion on the ſenſe.

Secondly, The air of each part ſhould be conſulted: for this will not only juſtify, but demand the changing of one note of the harmony for another.

Again, as the parts next each other ſhould ſtand in the cloſeſt concord; ſo, in order to effect this ſometime by contrary motion, they will meet in uniſon; and therefore the repetition of the three notes will not take place in every chord.

Theſe rules will be ſufficient to anſwer any doubt, or determine any choice to be made of any note of the concord, as well as juſtify the meeting of the parts in uniſon, in muſic of any number of parts whatever.

Second example in 7 parts. No. 61.

Third example in 7 parts. No. 62.

Sect. 8. Compoſition of Eight Parts.

The eighth and laſt part is the ſecond baſs; concerning

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ing which the following rules and obſervations muſt be premiſed.

If the muſick be compoſed for voices and inſtruments in full choir, it will be elegant and proper that the ſecond baſs ſtand in the neareſt concord with the firſt, after the example of the trebles and tenors.

The reaſon is, that the two choirs ſinging either together, or in reſponſes, will thus exhibit greater variety.

After this manner we ſhall ſet the two following examples.

If the muſick be for inſtruments only, the difference of the baſſes conſiſts in two things: Firſt, The organ hath the figures of the thorough baſs written. Secondly, The baſs viol performs the ſolo parts, while the organ reſts. And in full concert the two baſſes move in uniſon. This is the manner in which the baſſes of inſtrumental muſick are ſet by the moſt approved maſters.

We ſhall in this place offer our opinion on the ſubject of two baſſes in inſtrumental muſick, relating to ſome alteration from the uſual method of practice deſcribed above; which, as being perhaps new, will be received according to the notice it deſerves.

We would have the part for the organ move in long notes, and by the leaſt intervals; the figures filling up the harmony and diſcord; while the part for the violoncello moving in quicker notes, and greater intervals, becomes deſcant to the other baſs. Of this an example ſhall be given when we come, in the next place, to treat of plain deſcant.

To return: In muſick of 8 parts, the four notes of every chord are repeated, (allowing the exceptions remarked above.) Therefore, the full harmony of every note is double. The due mixture of which, according to the rules delivered, and the contrary motion of the parts, produce all the variety which harmony without diſcord is capable of affording.

Firſt example of compoſition of 8 parts. No. 63.

Second example in 8 parts. No. 64.

Having given examples ſufficient for inſtruction in compoſition of harmony in the ſeveral parts of muſick, and having illuſtrated in the ſame examples what hath been ſaid concerning the harmony proper both to flat and ſharp keys; we ſhall proceed to make ſuch obſervations on compoſition in general, as may aſſiſt the practitioner in the application of the rules at the beginning, or firſt attempts.

And firſt, concerning the conſecution of perfects; which muſt be avoided, except in contrary motion of the parts, or repetition of the concord in the ſame notes in each part, or in the octave.

Let the intervals which conſtitute the octave be remembered, as hath been ſaid above (in p. 321.) namely, a 5th and 4th, a 6th and 3d, a 7th and 2d; taking care, that when the note of one part riſes or falls by one of theſe intervals, the note of the other part ſhould not fall or riſe by the interval which is the complement of the octave.

Thus the conſecution of 8ths will be eaſily avoided, and much trouble thereby ſaved in ſetting the parts.

Again, by the ſame caution, we avoid the conſecution of 5ths. For the notes ſet in the concord of a 5th, riſing and falling together in the different parts, by the ſame conſtituent intervals of the octave, will likewiſe meet in a 5th; and, by avoiding ſuch movement of the notes of a 4th, the conſecution of the ſame is in the ſame manner prevented.

One inſtance of each will ſhew this evidently. No. 65.

The conſecution of perfects, it is true, is tolerated, when effected by contrary motion of the parts. But theſe obſervations are made for the ſake of a beginner, that he may not too often incur the abuſe of this liberty.

The next obſervation is concerning the harmony of the 4th in a flat key.

The 4th in a flat key is either part of the concord of the flat 7th, or hath for harmony its own chord.

The harmonical figures over the examples point out this to ſight. Notwithſtanding, it may be aſked in what caſe either harmony is to be preferred.

We ſhall endeavour to aſcertain this matter upon the principles on which what hath been already taught is demonſtrated.

In page 430. col. 1. we deduced this general theorem; That the trueſt harmony is produced by the whole concords taken together, falling in ſucceſſion, as frequent as is conſiſtent with the approved rules of harmony, by a 5th.

Therefore, when a cloſe is made on the ſemitone, or flat 3d, the harmony of the 4th or immediately preceding note, muſt be the concord of the flat 7th. For thus the whole chord, or harmony, according to the foregoing theorem, falls a 5th.

And this theorem extends to the harmony of every note whoſe interval is a ſemitone, or which ſtands a half tone above and a whole tone below its contiguous notes, whoſe movement into the next chord muſt be falling a 5th.

The places of the ſemitone in the harmony of the key, are the key, the flat 3d, the 4th (in a ſharp key,) and the flat 6th, and not in the harmony of the key, whereſoever a ſemitone is introduced by the addition of a ſharp or flat, whereby a cloſe may be made on the ſemitone above.

Thus the truth of the firſt axiom of the practice is eſtabliſhed; where it is ſaid, That the harmony of every note in the compaſs of muſick, proved by the rules of harmony, is part of the concord of the key, or its 5th, or a ſemitone. For the flat 7th is to the flat 3d a 5th.

In the other caſe, when a cloſe is not made on the flat 3d, or when the harmony need not fall a 5th, then the 4th may have for harmony its own chord. And here the 4th ſtands generally in the baſs. Thus No. 66.

The proof of this depends on the relative proportion of the flat and ſharp keys; and will be given, by that analogy, under the article of tranſpoſition.

The laſt obſervation is in reſpect of the practice of authors of inſtrumental muſick, in compoſition of many parts.

Whereas in the compoſition of 7 and 8 parts, the harmony of the notes are doubled: this is effected by the common practice, after the moſt eaſy manner, by doubling whole parts; that is to ſay, by two alternate parts moving through every note in uniſon, when in full concert; and likewiſe other two alternate parts. Thus the firſt and third violins play in uniſon; and the ſecond and

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and fourth. And, when these parts are not thus doubled, the third and fourth parts rest. Or otherwise, in some passages they take part of the harmony from the other parts, as in the examples above of 7 and 8 parts; excepting only in longer notes than the upper parts. The concertos of Corelli, Geminiani, and the overtures of Handel, are instances of this.

In a word, whatever form the parts of musick may be disposed in, the principles of harmony are the same.

And when the rules of composition in counterpoint, which is the ground-work, are well understood, and confirmed by practice, the remaining part will become easy in proportion as the composer will find himself more at liberty to dispose of the parts to such advantage as he will judge most suitable to the genius of the musick he is about to compose.

Chap. II. Of PLAIN DESCANT.

The second manner of composing is when the succession of concords is by notes of different lengths in the several parts. It differs from counterpoint, not in the principles of harmony, but only in the form.

The effect of descant is variety; which is produced, either when two or more notes of one part are set against one note in another, or when a long passage in one part is set against a single note in the other. This last manner is properly called descanting on that note. Or lastly, When a subject is set in the bass, and constantly repeated; while at every repetition of the same, there is a variation in the treble, which diversifies the harmony, but doth not deviate from the rules of art.

This bass, which is the first written part, is called a ground bass; and the piece of musick is called a ground.

Again, in descanting, it is usual for the parts to relieve each other; the bass sometimes holding the note, while the descant is in the treble; and again, the note is held in the treble, while the descant is in the bass.

The finest descant is where the discords are introduced in the passage of the notes. For here the air is less constrained; and the variety, in respect of the harmony, greater. This is figurate descant, which shall be treated of in the next chapter.

To return to plain descant: The movement of every part is more free than in counterpoint; and not so easy and unconstrained as in figurate descant. From this then arise its chief uses.

In the first place, it is the best introduction to the practitioner, to give an air to every part of his musick: It is also the ground-work of inventing variations in the treble upon a plain subject in the same part. The rules for plain descant are these.

Every note in the descant must be one of the harmony of each note in the bass; as demonstrated in composition in counterpoint.

Secondly, If the descant be variation on a given subject, in the treble, the original air must be preserved as much as possible in imitation of the same.

The harmony then being the same as in counterpoint, the difference being only in the form or length of the notes, one example, after so many given in counterpoint before, will be sufficient to illustrate this part. No. 67.

Whatever the subject of descant may be, whether a ground bass, or air in the treble, (the descant on which is called variations,) the practice is the same; as in the example, where the bass is the ground to the four trebles, the uppermost line of which may be called the air; and the other three descant on the bass; as well as variations on the subject, or first line.

For the more easy execution of both kinds, take these following rules of practice.

If you are to raise descant on a ground bass, then on this supposition the bass is first framed. Next let plain notes in the treble be set, as in the example, though no other use were to be made of them than to guide the composer's eye, and thereby furnish matter more readily for a better air and for the descant.

If the subject be an air in the treble, on which you are to make variations; as, in this case, the air is the first part written, so it is the object on the book to which you are to attend constantly as a pattern for the variations or descant.

It would be advisable also to set a plain bass to the treble or plain song, before you begin the variations. For, as the bass, or second note, in many cases determines the concord of the note; it thereby assists and rules the descant to be raised.

In general, when the two parts are set in plain harmony, the descant ought to imitate, and not depart from that design. If otherwise a discord be introduced in the composition of the two plain parts, or a discordant note be brought in in the treble or air, the descant must take part of the discord,

This properly belongs to figurate descant. Notwithstanding, it is an elegance common in practice, to throw in a discordant note in the variation, which is not in the plain song.

But these rules are addressed only to beginners.

Having done with plain descant, we shall here give an example of what hath been offered (p. 332. col. 1.) relating to the manner in which we would have the two basses set in composition of many parts; which is, That the part for the organ should move in long notes, and by the least intervals; the figures filling up the harmony and discord; while the part for the violoncello, moving by quicker notes, and greater intervals, becomes descant to the other bass.

The manner of setting the two basses depending on the principles of plain descant, and implying nothing more than what is contained in the last example, one instance of this will sufficiently answer our intention here.

Example of two basses in composition of many parts. No. 68.

The variety will be still greater if this manner be pursued in figurate descant. For as undoubtedly that is the best and most perfect composition where discord is intermixed; so there is no variety, which musick is capable of, produced from the form or disposition of the parts, that will not receive improvement from the more perfect composition.

The

The laſt example therefore, and what hath been ſaid of the two baſſes in plain deſcant, is meant as an introduction to a trial of the ſame in the more perfect, or figurate deſcant, both in the compoſition and performance.

Chap. III. Of FIGURATE DESCANT.

Figurate deſcant is the mixture of diſcord and concord, by notes of the ſame or different lengths or time, in the ſeveral parts.

Every interval in muſick which is not harmony, muſt be diſcord.

The diſcords therefore are ſix: namely, the leſſer and greater 2d; the ſharp 4th, or flat 5th; the leſſer and greater 7th; and the 9th. The reaſon for repeating the 9th, which is the 8th to the 2d, ſhall be ſhewn in its place.

The uſe of diſcord is twofold: To give a better air to every part of the muſick; and to create variety. For the diſcords ſtanding in the natural order of the notes, between the concords, afford an eaſy paſſage of the ſame; and, at the ſame time, mix with, and bind the harmony.

Diſcords are introduced in compoſition ſeveral ways.

Firſt, When the notes paſſing in the natural order, two, three, or more of one part are ſet againſt one of another part. This paſſage of the notes is ſaid to be by diminution; as in the following example.

Example of diſcords in paſſage by diminution. No. 69.

When the treble deſcends, the diſcords deſcend likewiſe into the concords; that is, the 9ths paſs into 8ths, the 7ths into 6ths, and ſo forth. The ſame thing happens when the baſs aſcends.

When the treble aſcends, or the baſs deſcends, the contrary happens; that is, the 2ds paſs into 3ds, and the 7ths into 8ths, or the diſcords into concords, according to the natural numbers.

When a ſingle diſcordant note is ſet, the change of that note into a concord is properly called the paſſage of the diſcord.

When the accompaniments are ſet along with the diſcordant note; that is, when the whole diſcord, either in compoſition of many parts, or in figures in the baſs, is expreſſed, the change of the ſame into a concord is juſtly called the reſolution of the diſcord. The paſſage of the diſcord in ſingle notes moving according to the natural order, as in the laſt example, is evident.

The accompaniments and reſolution of the whole diſcord depend on certain principles; on which we ſhall, in its place, demonſtrate the ſame.

To proceed, then, on ſingle diſcords.

The ſecond way in which diſcords are uſed in compoſition is, when the notes of each part move alternately, a long note between two ſhort ones, ſo that the note of one part breaks off and ends in the middle of the note of the other part. This is called ſyncopation or binding; for the frequent mixture of the diſcord here ſupports and binds the harmony;

As in this example. No. 70.

In this manner the air of either part is leſs conſtrained, by the conſtant return of the diſcord, and paſſage into the concord. In ſome places this happens by the natural ſucceſſion of the notes by diminution, as in the firſt example, though not ſo frequently as in the laſt manner by ſyncopation. But there is a paſſage of the diſcord into the concord, formed by the notes moving by greater intervals.

This muſick is preferable on account of the great variety produced by this unexpected, and, we may ſay, ſurpriſing mixture of the diſcord and harmony. For variety itſelf cauſes new pleaſure, when it is leaſt expected, or when attended by novelty.

This moving of the notes by greater intervals, is the third way of introducing diſcord; and is the effect of the diſcords and concords conſtantly meeting by contrary motion of the parts.

In this manner the variety ariſes from the paſſage into concords, different from thoſe which muſt ſucceed, either in the natural order of the notes, or by ſyncopation.

The variety alſo is greater by the conſtant ſucceſſion of diſcord and harmony almoſt through every note.

For here the compoſer is at liberty to paſs into any concord he pleaſes; and to reſume any diſcord. For as the paſſage into the perfect concords, between two parts, cannot be effected, but from the neareſt diſcord, when the notes move in the natural order; ſo, when the notes move by greater intervals, there is opportunity for many paſſages, which could not take place in any other way.

All this will be evident, when we come to underſtand the reſolution of the diſcords.

Example of the more perfect mixture of diſcord and harmony. No. 71.

In this example are ſet forth the two firſt ways of uſing diſcords; namely, by diminution and ſyncopation, as well as paſſing by greater intervals; being ſet according to the rules relative to each manner. Where the diſcord and harmony move by greater intervals, there the paſſage is from diſcords new and unpractiſed in the other two.

The compoſition, where this liberty is taken, does moſt juſtly challenge the name of ornamental or figurate deſcant.

And the muſick, wherein the diſcord is uſed theſe three ſeveral ways in their turn, muſt be eſteemed the beſt, as exhibiting greater variety than could be expreſſed the other ways only. Let it be remarked in this place, that this new paſſage of the diſcord is effected by both parts generally moving by a ſemitone; the power of which will be ſeeen when we ſhall have demonſtrated the accompaniments and reſolutions of the whole diſcord.

There is a fourth way wherein diſcords are admitted in compoſition. This is when diſcords ſucceed each other; or, where there is no paſſage into a concord. This is ſetting diſcords note againſt note. It is to be done two ways. Firſt, when the diſcord paſſes into one of another denomination, in the natural order of the notes, by contrary paſſage of the notes of each part, of the ſame or nearly equal quantity.

This paſſage of the diſcord is neceſſary, as we cannot aſcend or deſcend by the degrees of a great interval; but the intermediate diſcords will take place, and thence oftimes two will ſucceed each other.

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This liberty is to be uſed chiefly in ſhort notes, and by diminution.

Example of diſcords ſucceeding each other, or ſet note againſt note. No. 72.

Secondly, Diſcords are admitted, note againſt note, when the ſame diſcord is often repeated. This liberty is taken with the diſcord of the flat 7th above all others; and is moſt juſtly practiſed in muſick of three parts. When this diſcord is brought in ſucceſſively in two parts, the complement of the chord ought to be written in the treble.

Example of the diſcord of the flat 7th ſucceſſively. No. 73.

This example is taken out of the eleventh ſonata of Corelli's fourth opera.

In this example, it is remarkable, that the firſt and ſecond trebles furniſh by turns the diſcord to the baſs; which conſtantly deſcends by a 5th, while the intervals of the upper parts are 5ths and 4ths to the baſs alternately. Obſerve, when the note in the baſs is flat, the diſcord will be the ſharp 7th.

The imitation of this paſſage may be learned by inſpection of the example. The demonſtration depends on the demonſtration of the third reſolution of the diſcords following; which we muſt therefore reſerve for that place.

An example of this paſſage ſhall be given when we come to teach the uſe of diſcords in muſick of three parts.

Having done with the ſingle diſcords and their paſſages, we proceed, in the next place, to the complex ones; by which are meant the ſame diſcords with their accompanyments and reſolutions.

Now, as, by axiom the ſecond of the theory, from the natural order of notes, the properties, proportions and relations of ſounds, which ariſe out of their various combinations and ſucceſſions, are deduced; we ſhall demonſtrate the properties of the diſcords upon the ſame principle.

The firſt property of the diſcord is the notes which are to be played in the thorough baſs, in concert with the diſcord. Theſe notes are called the accompaniments.

On the exact knowledge of theſe depends the ſecond property of the diſcord; namely, its paſſage into a ſucceeding concord.

This paſſage is called the reſolution of the diſcord, as mentioned above.

Each diſcord hath its own diſtinct properties. Therefore the definition of diſcord already given is juſt; where it is ſaid, that diſcord conſiſts in certain variable proportions of the diſtance of ſounds,

As two ſingle notes ſtanding at a certain interval, form the diſcord, ſo they may eaſily be reſolved into the proper ſucceeding concord, as we have already ſhewn.

And on inſtruments which have not keys, no more than the two notes can well be performed. Yet, as the reſolutions of the diſcords cannot be demonſtrated without the knowledge of the accompaniments, we ſhall conſider the whole diſcord together; and demonſtrate the accompaniments of each particular diſcord, after the ſame method we have proved the harmony of each note of the octave in counterpoint.

THEOREM. Since every interval in muſick is diſcord or harmony, the accompaniments of moſt diſcords will be harmony in themſelves: for thus they will be diſcord to the given note. But it will alſo happen, that ſome note of the accompaniment in other caſes will alſo be harmony to the given note, yet the whole accompaniment diſcord in itſelf. For the ſoul ſo accords with harmony, as not to bear an entire perfect diſcord.

Now, as more or leſs of diſcord with the given note prevails; ſo the diſcords are naturally divided into proper and inharmonic.

A proper diſcord is the concord of ſome member of itſelf, and only diſcord in part with the baſs or given note.

An inharmonic diſcord is an abſolute diſcord in itſelf, and partly concord to the baſs or given note.

There are five proper diſcords; namely, the leſſer and greater 2d, the ſharp 4th (or flat 5th,) the ſharp 7th, and the 9th.

There is one inharmonic diſcord; which is, the flat 7th. It hath three places in the compaſs of the octave; where it appears in three different forms.

It is called inharmonic; not only becauſe it is an abſolute diſcord in itſelf, but alſo becauſe it is not the accompaniment to the baſs note, from whence the order of the diſcords is traced in the natural ſeries; except in one place or form, which is the ſecond; wherein the flat 7th is the uppermoſt note of the chord. This will be ſeen moſt clearly, when we ſhall have gone through the diſcords of each kind in their natural order, in the table of diſcord and harmony. No. 82.

We proceed therefore to the demonſtration of the diſcords. And, according to the 2d axiom of the theory, ſhall begin with the demonſtration of the accompaniments of the 2d.

As in the demonſtration of the concords we begin with the key-note, which we conſidered as an immoveable point, from whence our calculations were to proceed; ſo we ſhall here conſider the baſs, or lower note of the diſcord, that immoveable point; and the upper diſcordant note the interval in queſtion, whoſe properties are to be found.

Demonſtration of the accompaniments of the 2d.

The accompaniments of the 2d are the 4th and 6th to the baſs or given note, or the diſcord of the 2d is the concord of the ſame.

The 2d is a proper diſcord: Therefore the accompaniments of the 2d are its 3d and 5th. But the 3d and 5th to the 2d, or diſcordant note, are to the given note the 4th and 6th; therefore, the accompaniments of the 2d are the 4th and 6th.

Example of the firſt diſcord, or diſcord of the 2d. No. 74.

Proper diſcord.

The diſcord of the 2d muſt be a proper diſcord: for the 3d and 5th to the baſs with the 2d would be intolerable diſcord, ſeeing they are three notes in the natural order, and the 5th and 7th is the harmony of the 2d; therefore they muſt be the 6th and 8th, which is the gi-

ven note: But the 6th will have the 4th; therefore the diſcord of the 2d is a proper diſcord.

By the 2d axiom of the theory, the properties, proportions and relation of ſounds are deduced from the natural order of the ſame. Which axiom is extended to the diſcords, as they are combined of the natural notes, and differ from the concords only in form.

On this axiom, then, we are to inveſtigate the next ſucceeding diſcord. The 2d diſcord is the 2d, 4th, and ſharp 7th to the given note. For theſe are the next ſucceeding diſcordant notes.

Demonſtration of the ſecond diſcord.

The 2d and 4th cannot have the flat 7th; for they are harmony, or concord of the flat 7th; and the 8th is the given note: therefore it remains, that the ſecond diſcord is the 2d, 4th, and ſharp 7th to the given note.

Example of the ſecond diſcord. No. 75.

Inharmonic diſcord.

This is an inharmonic diſcord; being an abſolute diſcord in itſelf. It hath but one concording note with the baſs; which is the 4th. This 4th is the flat 7th to the given note's 5th: which 5th is the baſs to this diſcord; the given note in this place being conſidered only as a point, or unity, from which we are to inveſtigate the next diſcordant notes, according to the 2d axiom.

The property of this inharmonic diſcord, or flat 7th, is, that its own diſcordant interval, or that which is formed by the accompaniment, is always a ſharp 4th, or flat 5th, which diſtinguiſhes it at ſight from every other diſcord. And every inharmonic, where-ever found, hath the ſame property. The reſolution alſo of every inharmonic is the ſame; as we ſhall ſee, when we come, in the next place, to ſhew the reſolutions of the diſcords.

The next diſcord, according to the 2d axiom, is the ſharp 3d, 5th, and flat 7th to the given note. This is alſo an inharmonic, or flat 7th; and having the ſame property with the former, namely, the flat 5th, muſt not be accounted a new diſcord. No. 76.

Inharmonic diſcord.

This is the inharmonic diſcord in that form, whoſe accompaniments are relative to the baſs, or given note.

The third diſcord is the 3d, 5th, and ſharp 7th to the baſs, or given note.

Demonſtration of the third diſcord.

The ſharp 3d, 5th, and ſharp 7th, muſt conſtitute the next diſcord. For the flat 3d, 5th, and flat 7th, are harmony, or concord of the flat 3d; and the 8th with the 3d and 5th, are the chord of the baſs note; and the flat 7th, with the ſharp 3d and 5th, are the inharmonic laſt mentioned; therefore, the ſharp 3d, 5th, and ſharp 7th, are the 3d diſcord.

Example of the third diſcord. No. 77.

Proper diſcord.

This is a proper diſcord, being the concord of the 3d to the baſs; and the ſharp 7th the diſcordant note.

To proceed then according to our 2d axiom, the next diſcordant notes in order, are the 4th, 6th, and 9th: But theſe being the notes which conſtitute the firſt diſcord, varying only in place and name of the 9th, for the 2d, are in effect the ſame diſcord.

The next ſucceſſive diſcordant notes are, according to our well known axiom, the 4th, ſharp 7th, and 9th. But theſe likewiſe conſtitute the 2d diſcord in like manner, as was ſaid in the former caſe; and therefore cannot be reckoned a new diſcord.

To proceed then by our axiom: The next aſcending notes, by the ſmalleſt intervals, are the ſharp 4th, 6th, and 8th. This is an inharmonic, or flat 7th; its flat 5th being formed by the ſharp 4th and 8th; therefore no new diſcord. No. 78.

To go on, the next diſcordant notes will be found the ſharp 4th, 6th, and 9th.

Demonſtration of the fourth diſcord.

From the proof of the laſt inharmonic diſcord, the ſharp 4th and 6th can form a proper diſcord with no other interval but the 9th; for the 7th would produce three notes in the natural order, and intolerable diſcord. Therefore the fourth diſcord is the ſharp 4th, 6th, and 9th.

Example of the fourth diſcord. No 79.

This is a proper diſcord, being a concord in itſelf, and only diſcordant to the baſs note. The diſcordant notes of it are the ſharp 4th and 9th.

The next which preſents itſelf, is the 5th, ſharp 7th, and 9th, by the ſame axiom.

Demonſtration of the fifth diſcord.

The 5th will admit no other diſcordant notes but the ſharp 7th and 9th. For the 8th and 10th make the concord of the baſs note; and the ſharp 7th and 10th is, with the 5th, the third diſcord already proved; and any other note would be double diſcord, and intolerable: therefore, the fifth diſcord is the 5th, ſharp 7th, and 9th.

Example of the fifth diſcord. No. 80.

Proper diſcord.

This is a proper diſcord, being a concord in itſelf; and diſcordant only with the given note. Its diſcordant notes are the 7th and 9th.

We have purpoſely reſerved the diſcord of the leſſer 2d to the ſixth and laſt place, 1ſt, Becauſe, as the interval next above the key is always a whole tone, we cannot, according to our 2d axiom, erect this diſcord as relative to the given note, or key; as we have done the other five. 2dly, The reſolution of this diſcord will be found different from that of the greater ſecond; for reaſons which will abundantly appear, when we ſpeak of the reſolutions. This diſcord may properly be called the diſcord of the ſemitone.

Demonſtration of the diſcord of the ſemitone.

The diſcord of the ſemitone, or leſſer 2d, is, like that of the greater 2d, or whole tone, the 2d, 4th, and 6th. The demonſtration is the ſame as that of the greater 2d, and therefore need not be repeated here.

Example of the ſixth diſcord. No. 81.

This is a proper diſcord, like that of the greater 2d, being

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being a concord id itſelf. Its note diſcordant with the baſs is the 2d.

It hath been ſaid, that all harmony is divided between the flat and ſharp keys.

The mixture of diſcord and harmony enables us to extend the like obſervation in this place much further.

Hence the following corollary.

The compoſition of all muſick, of any number of parts whatever, is divided between the harmony of the flat and ſharp keys, and the juſt mixture of diſcord with it.

To illuſtrate theſe truths, we ſhall ſet in one view every concord and diſcord, in the whole compaſs of muſick, in their natural order. No. 82.

Hence we ſhall derive ſome uſeful corollaries, which will lead us to diſcover what is next to be conſidered, the ſecond property of the diſcords, or their reſolutions into the concords.

The manner of reading this is as follows:

This concord is the concord of the key.

This concord is the concord of the 2d to the key, or given note.

This concord is the concord of the flat 7th.

This diſcord is inharmonic, and ſo forth: deſcending ſtill from the uppermoſt lines of harmony, or diſcord, to the loweſt line, or baſs.

In this view is ſeen the mixture of diſcord with harmony, each in the natural order. Wherein, indeed, nothing regular or proportioned appears to ſight. The reaſon of this is evident from the demonſtration of the harmonical proportions. For, if they be of a ſpecies different from all other proportions, as by corollary 2d of the theory, and muſt be demonſtrated on principles peculiar to them; then the ſucceſſion of the diſcords, conſtantly taking place between the intervals of harmony, muſt be diſproportioned too. This appears to ſight in the next example, or view of harmony and diſcord in the natural order. No. 82.

However irregular this may ſeem, an uniformity prevails through the whole, which ſupports that variety in muſick ſo deſirable: Without which variety, there could have been but one concord among ſounds; a ſameneſs prevailing through the whole; without ſemitone, and conſequently without diſcord. In this caſe, muſick never could have exiſted as an object of pleaſure to the ſenſe; much leſs of ſcience.

This admirable ſtructure is raiſed on the power and property of the ſemitone, which ſhall be the ſubject of the following corollaries.

Cor. I. Every ſemitone in the octave hath either a concord or diſcord proper and peculiar to itſelf. Yet, the natural ſucceſſion of the concords and diſcords is not according to the aſcending and deſcending ſemitones. For, it is evident, in the annexed table, that the correſponding baſs notes conſtantly deſcend by 3ds, the variety, at the ſame time, ſhining throughout the harmony and diſcord in the upper parts, aſcending by ſemitones. Yet the baſs expreſſes every ſemitone in its paſſage by 3ds, uniformly to its period.

This moſt ſtrongly illuſtrates the truth of the 4th axiom of the theory; namely, that the concords and diſcords, either in their natural order, or arranged by art, will not ſuffer us to depart from the eſtabliſhed precept of variety amidſt uniformity.

The ſame uniformity, or rather unity, is exhibited ſtill more plainly in the 5th diſcord, in the coincidence of diſcord and harmony in the ſame individual ſounds.

For this diſcord, which is the diſcord of the 9th, is alſo the harmony of the 5th.

This is truly admirable, and furniſhes us with the moſt intereſting remark in the compaſs of muſick, as in the following corollary.

Cor. II. The ſcope of muſick, and motion of the parts, muſt at length terminate, and meet in one invariable thing Harmony.

Thus are we arrived at the full extent, or bounds of muſick. It it is fit we now return to make ſuch further obſervations as will lead us to the knowledge of the reſolutions of the diſcords, which is the next thing to be ſpoken to.

The diviſion of diſcords into proper and inharmonic, we have made for the ſake of clearneſs and method. The difference already pointed out between the diſcords muſt be remembered; which is, that the property of the inharmonic, or flat 7th, (which note does ever, with another note of the chord, frame the ſharp 4th, or flat 5th) is the ſame, in whatever place or form it is met with; whereas the proper diſcords eſſentially differ from each other, and in every particular.

The three inharmonic therefore, in the natural order of the diſcords, are not ſo properly three, as the ſame diſcord in different light; where it is a preparation for a cloſe on the key, and on the 4th and 5th to the key.

The baſs to the diſcords moves by 3ds deſcending in a ſharp key.

The notes of the baſs, correſponding to the proportions of the flat key, have no relation to the diſcords in the line next above; but are the baſs to the concords in the flat key, as demonſtrated in the rules of harmony.

The two diſcords, which are a repetition of the firſt and ſecond, are ſet down in compliance with the 2d axiom, to purſue the natural order. And hence they ſerve to demonſtrate there can be no other diſcord than thoſe exemplified in the ſcheme. For there is no ſemitone in the octave which doth not appear there to have its diſcord or harmony connected with it.

In this ſcheme then is compriſed every interval of muſick, with the members of each chord reſpectively, both diſcord and harmony, in the natural order.

From the ſame order, we ſhall demonſtrate the paſſage of the diſcords, into the concords or reſolutions of the ſame.

In the theory, it hath been ſaid, that the ſemitone is the principle, or hinge, on which turns the reſolution of every diſcord.

On this principle, then, we ſhall now demonſtrate the ſame.

The diſcords ſtand in the natural order between the concords; but every note of the chord is not equally near reſpectively.

From the idea of harmony, which is fitneſs or propor-

tion,

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tion, the paſſage of the diſcord muſt be to the neareſt concord; therefore, the reſolution will be by the ſmalleſt interval, that is, by the ſemitone.

This is the general theorem for the reſolution of every diſcord. We will now apply it,

The reſolution of the diſcord of the 2d is into the concord of the given note.

The 4th, or ſemitone, will move into the 3d, but the 3d will have for harmony its 3d; therefore, the 6th muſt deſcend into the 5th, and the 2d's paſſage by the neareſt interval will be into the given note. By theſe paſſages is formed the chord of the ſame; therefore, the reſolution of the diſcord of the 2d is into the concord of the given note.

In a flat key, there are two paſſages by ſemitones; that of the flat 6th into the 5th, and of the 2d aſcending, by contrary motion, into the 3d.

Example of the reſolution of the diſcord of the 2d, or firſt diſcord. No. 83.

Proper diſcord.

The reſolution of this diſcord being into the given note, the baſs does not move.

The reſolution of the ſecond diſcord is into the concord of the given note.

The ſecond diſcord is the 2d, 4th, and ſharp 7th. The ſharp 7th and 4th move by the ſemitones and contrary motion into the 8th and 3d, while the 2d falls a 5th into the 5th. Theſe are the concord of the give note: therefore the reſolution of this diſcord is into the concord of the given note.

Example of the reſolution of the ſecond diſcord being inharmonic. No. 84.

Inharmonic diſcord.

The reſolution of this diſcord being into the concord of the given note, the baſs aſcends by a ſemitone.

The paſſage of this inharmonic by contrary motion of two ſemitones, and the other note falling a 5th, is the reſolution of every inharmonic, where-ever introduced. This therefore needs no repetition. But if the ſucceeding concord has a flat 3d, the paſſage is by two aſcending ſemitones; the 2d riſing into the 3d, the 7th into the 8th, and the 4th by a whole tone into the 5th. This movement can only happen in the reſolution into the key.

The other, of much more extenſive uſe, is the true reſolution of the inharmonic diſcord; and more intereſting, as, by its contrary motion of the ſemitones, it better binds the harmony.

It is neceſſary here to explain further the nature of the inharmonic diſcord.

The inharmonic diſcord, then, is always the chord in a ſharp 3d, with a flat 7th; which two notes frame the interval which characteriſes this chord, namely, the ſharp 4th, or flat 5th: when the flat 7th is the upper note of the two, the interval is the flat 5th; when the ſharp 3d is the upper note, the ſame interval is called the ſharp 4th. Theſe notes being relative to the fundamental note either of them determine the chord.

As the inharmonic is found in different places of the octave, ſo conſequently the note of the chord muſt vary accordingly; the ſecond inharmonic therefore only, in the natural order, hath reference to the given note in the table, as that happens to be the note of the chord. For the given note there is to be accounted only a point or unity, from whence we proceeded to trace the diſcords in their natural order, as they lie between the concords. The chord note, therefore, of the firſt inharmonic is the 5th to the given note; and of the laſt inharmonic, it is the 2d to the ſame. Now, as the whole chord falls a 5th in the reſolution, ſo the firſt is a preparation for a cloſe on the key, the ſecond for a cloſe on the 4th, and the laſt for a cloſe on the 5th; now, as any note of the chord may ſtand in the baſs, ſo the third is often preferred before the chord note, for the ſake of the movement of the baſs by a ſemitone, as well as becauſe falling a 5th in the baſs is more properly the part of harmony.

The flat 7th is likewiſe choſen for the baſs note; for the ſame reaſon, the movement of the baſs by a ſemitone deſcending; which is no inconſiderable uſe of diſcords. For in figurate deſcant, as we have ſaid, all the parts move more freely.

The next diſcord is likewiſe inharmonic. It is the ſharp 3d, 5th, and flat 7th to the given note; which note is likewiſe that of the chord. No. 85.

Note, the reſolution of every inharmonic being into its 5th below the chord, the reſolution of this will be into the 4th of the given note; as riſing a 4th, and falling a 5th, anſwers the ſame thing in eſtimating the intervals of harmony.

Inharmonic diſcord.

Example of the ſecond inharmonic diſcord and its reſolution: here the baſs note is the note of the chord; therefore, in the reſolution it falls a 5th, which is the 4th to the given note.

The flat 7th deſcends by a ſemitone into the 3d, the 3d riſes by a ſemitone into the 8th, and the 5th falls a 5th into the 5th of the concord. The reſolution therefore is into the 4th of the key.

This is that form of the inharmonic diſcord on which the compoſition of the paſſage taken out of Corelli, (No. 73.) is grounded. Obſerve, that in the cited paſſage, and alſo in every like paſſage, the two notes of the baſs move to only one note of the ſecond part, which becomes the flat 7th by this movement of the baſs.

Thus the flat 7th is given, in the upper parts by turns, to every note in the baſs, as hath been before remarked.

Reſolution of the third diſcord.

The third diſcord is the 3d, 5th, and ſharp 7th, to the given note; it is reſolved into the 6th to the ſame. For the 7th aſcends into the 8th or 6th's 3d, the 5th riſes a whole tone into the 6th, and the 3d not moving becomes the 5th. The reſolution of this diſcord therefore is into the chord of the 6th.

Example of the reſolution of the third diſcord. No. 86.

Proper diſcord.

This is a proper diſcord; in the reſolution of which the baſs falls a 3d, while the whole diſcord falls a fifth.

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The next diſcord is the ſharp 4th, 6th, and 8th. It is inharmonic. Its reſolution is into the chord of the given note's 5th. No. 87.

Reſolution of the third inharmonic diſcord.

Of this diſcord the baſs note is the flat 7th; it deſcends by a ſemitone, while the whole chord falls a 5th.

Inharmonic diſcord.

Its reſolution is the ſame as that of every inharmonic, in what form ſoever, by the contrary motion of the two ſemitones, while the third note falls a 5th.

Reſolution of the fourth diſcord.

The fourth diſcord is the ſharp 4th, 6th, and 9th. Its reſolution is likewiſe into the chord of the note's 5th.

For the ſharp 4th aſcends into the ſucceeding concord's 8th, the 6th paſſes into the 3d, and the 9th not moving becomes the 5th. Thoſe are the chord of the note's 5th.

Example of the reſolution of the fourth diſcord. No. 88.

Proper diſcord.

This diſcord is a mixture of the proper and inharmonic. It is a proper diſcord, for that the notes of the treble are concord; and inharmonic, in reſpect of the baſs, with which it makes the diſcord of the ſharp 4th.

It differs from the foregoing, where the flat 7th is expreſſed in both treble and baſs; whereas, in this, it is only in the baſs.

The baſs here alſo deſcends by a ſemitone, while the chord falls a 5th.

Reſolution of the fifth diſcord.

The fifth diſcord is the 5th, ſharp 7th, and 9th. It is reſolved into the concord of the baſs note.

For the 5th is that note's 5th; the ſharp 7th aſcends by a ſemitone into the 8th; and the 9th (or 2d) paſſes into the 3d. Thus it is reſolved into the chord of the given, or baſs note.

Example of the reſolution of the fifth diſcord. No. 89.

Proper diſcord.

In this reſolution the whole chord falls a 5th, while the baſs ſtands ſtill, or deſcends into the octave.

This is plainly the laſt diſcord in the order of ſounds. Its reſolution is into the given note or key, by the paſſage of the great cadence, or deſcent by a 5th. It is a concord in itſelf; and is in harmony the concord of the 5th.

In this chord diſcord and harmony are united. When it ſtands in diſcord with the baſs, the baſs doth not move in the reſolution; when it ſounds perfect harmony with the baſs, then the baſs deſcends a 5th.

Therefore we conclude, Harmony and diſcord are like two finite lines, whoſe beginnings are at a certain diſtance; and in the natural progreſſion converge conſtantly, until they meet in a point.

The diſcord, which we have reſerved to the ſixth place, is that of the leſſer 2d, or ſemitone.

Its places in a flat key are the 3d and 6th; and in a ſharp key the 4th and 8th, or where-ever a new ſemitone is introduced.

It is a proper diſcord, being a concord in itſelf, whoſe chord hath always a ſharp 3d.

Its properties are everywhere alike; but its reſolution differs from that of the greater 2d, for the reaſon aſſigned in the reſolution of every diſcord; that is, the paſſage by the ſemitone.

Reſolution of the leſſer 2d, or ſemitone.

The diſcord of the leſſer 2d is the 2d, 4th, and 6th to the baſs; or, the concord of itſelf.

Its reſolution is into the concord of its own 3d or 5th. It riſes into the concord of its 3d by the ſingle paſſage of the ſemitone deſcending. And into the concord of its 5th by the 4th deſcending along with the ſemitone.

Example of the reſolution of the diſcord of the ſemitone. No. 90.

In the firſt reſolution, the chord riſes a 3d, and the baſs falls a 5th. In the ſecond, the chord riſes a 5th, and the baſs falls a 3d, the reverſe of the former.

From the reſolutions of the diſcords we derive the following corollaries.

Cor. I. There is no interval of harmony that is performed by the baſs in the reſolution of one diſcord or another.

Hence we may conceive that harmony regulates even the diſcords, and preſides in every part of muſick.

Cor. II. The inharmonic diſcord, or flat 7th, is a preparation to a cloſe on a key, the 4th and 5th, flat 3d and flat 6th; for into the harmony of theſe it is reſolved; they being the intervals on which cloſes may be made according to the eſtabliſhed rules of melody. And univerſally, whereſoever a cloſe may be made by introducing a new ſemitone, the preparation may be made by the flat 7th, or inharmonic diſcord.

This diſcord, being of ſuch extenſive uſe, will deſerve ſome further remarks, which may render the ſetting of the ſame more eaſy, and aſſiſt the performer in the taking and reſolution of it.

In the inharmonic diſcord, then, are three notes chiefly concerned, which are the note of the concord; its 3d, (which is always ſharp;) and the flat 7th: either of theſe may be ſet in the baſs. Hence there will ariſe three varieties.

If the note of the chord be the baſs note, the figure is the flat 7th; the chord is that of the ſame note; and the baſs falls a 5th.

Secondly, When the 3d is the baſs note, the figures are flat 5th and 6th; the chord is that of the 6th to the ſame 3d; and the baſs aſcends by a ſemitone.

Thirdly, If the flat 7th ſtand in the baſs, the figures are the ſharp 4th, 6th, and 9th; the chord is that of the 2d to the baſs note; and the baſs deſcends by a ſemitone.

Example. No. 91.

The 5th of the chord may likewiſe ſtand in the baſs; but as the movement of the ſame is by a whole tone deſcending, it is very ſeldom uſed.

The figures are ſharp 6th. flat 3d.

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Cor. III. Hence the baſs aſcending or deſcending by a ſemitone, furniſhes an opportunity of introducing notes in the upper parts, which will conſtitute the inharmonic diſcord.

And again, the ſharp 3d of any chord in the treble, or any note having the addition of a ſharp, and thereby becoming the greater 7th, may be the 3d of an inharmonic; the baſs taking the flat 7th. For the ſharp 3d of the chord, (which is the ſharp 4th to the flat 7th in the baſs, or elſewhere,) and the flat 7th, in whatſoever part they are ſet, in baſs or treble, or both in the treble, conſtantly move each his own way; the firſt aſcending, and the latter deſcending by a ſemitone.

Theſe are the ſimple diſcords as they are found to lie in the natural order of ſounds between the concords; whoſe accompaniments are, for the moſt part, harmony among themſelves. It is evident, from the method in which we traced them, that there is no other diſcord among ſounds. Notwithſtanding, from the combination of two ſimple diſcords, a new form of diſcord may be framed, which taketh part of the inharmonic and diſcord of the ſemitone; which, therefore, we call the compound diſcord.

This diſcord is the ſharp 3d, flat 7th, and flat 2d, or ſemitone to any note whoſe chord hath a ſharp 3d.

It is reſolved, by the paſſage of three ſemitones, two deſcending, and one aſcending, into any concord with a ſharp 3d; and therefore may be introduced as a preparation to any concord, in either flat or ſharp key, where the greater 3d is.

Example of the compound diſcord, and its reſolution. No. 92.

The reſolution of this diſcord, as it is compounded of the diſcords of the flat 7th, and ſemitone, will partake of the reſolution of the ſame. Thus the upper note, or ſemitone, deſcends into the 5th of the concord; and the flat 7th and 3d meet by contrary paſſage of a ſemitone each into the 3d and 8th part of the reſolution of every inharmonic, while the baſs deſcends a 5th. Thus the paſſage into every note of the concord is by a ſemitone; ſo great a favourite of nature is the ſemitone.

By changing the form of this diſcord, it will be reſolved into a chord with a flat 3d, by one ſemitone deſcending, and two aſcending; the two extreme notes of which are the ſame as in the example above; but the middle note is the 5th aſcending into the 3d, inſtead of the flat 7th deſcending. The upper notes therefore form the flat 5th, or inharmonic interval. No. 93.

The properties of thoſe diſcords, and of the inharmonic, furniſh us with ſome practical obſervations; which are, that the two diſcordant notes of theſe diſcords are, in muſick of two parts, a preparation to, or paſs by contrary motion of the ſemitones into the concords of the ſharp 3d, flat 6th, and 5th. When the flat 7th is the uppermoſt note, and the lower the ſharp 3d, they paſs into a ſharp 3d.

When the upper note is the ſharp 3d, and the flat 7th is below, they paſs into the flat 6th; ſo do likewiſe the flat 7th above, and the chord note below.

Laſtly, the two extreme notes of the compound diſcord paſs into the concord of the 5th.

Example of the paſſage of diſcords in muſick of two parts. No. 94.

In like manner there is a paſſage into the octave from a diſcordant interval; the upper note of which is part of a concord, and the lower the ſemitone of the compound diſcord. No. 95. Or the contrary.

There is no paſſage by two ſemitones into the flat 3d and ſharp 6th from any diſcordant interval, except the ſemitone. For, in the paſſage of quick notes encountering each other by contrary motion, this, or any other diſcordant interval, may fall into the concords. But ſuch, being tolerated only for their quickneſs, need not be reduced, as indeed they cannot, to any rules of art.

Laſtly, the baſs will admit two notes together, each concording with it, namely, the 5th and 6th, and making a diſcord between themſelves.

This diſcord, which differs from the proper and inharmonic, is rightly called the mixed diſcord; each of the two notes being in harmony with the baſs, and diſcordant to each other.

The framing of this diſcord depends upon the rules of harmony, and may be ſet to any note of the baſs which hath for harmony its own concord, and is likewiſe the member of another.

Therefore, in the ſharp key, the key and 5th, and in the flat key, the key 3d, 5th, and flat 7th, admit a 5th and 6th.

When we ſhall have proved, under the article of tranſpoſition, the 4th in a flat key, and 6th in a ſharp key, to have their own concord; they will be found, no doubt, to have the privilege of admitting a 5th and 6th.

For thus it is underſtood. The key hath a 5th in its own right, and a 6th as member of the 4th.

The 5th hath a 5th in its own right, and a 6th as member of the key.

The flat 3d hath a 5th in his own right, and a 6th as member of the key.

The flat 7th hath a 5th in his own right, and a 6th as member of the 3d.

Thus the 5th and 6th will ſtand together to the baſs.

The properties of ſounds in the natural order may be tranſferred by art, and improved into all the variety poſſible; as this is no other than an imitation of nature.

Hence we infer, that every note, which aſſumes the nature of the key, by the addition of the greater 7th, will admit a 5th and 6th.

This 5th is eaſily diſtinguiſhed from the 5th of the inharmonic, which is always an imperfect one, and ought conſtantly to have a flat prefixed.

Now the chord of the inharmonic with a flat 5th is that of the 6th to the baſs note, as hath been ſaid. But the chord of the mixt diſcord may be better underſtood to be the chord of the baſs note, with a 6th added.

Sect. 2. *Of* Figuring *the* Bass.

Having delivered all that hath fallen under our obſervation concerning the nature, proportion, and uſe of diſcord; we ſhall now make an application of the ſame, in order to explain the figuring of the baſs; the next article propoſed to be ſpoken to.

Firſt, Of figuring the concords.

That

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That the notes whoſe harmony is their own chords, need no figures, is evident from the definition of harmony; which conſiſts of one certain, invariable proportion of ſounds.

Theſe are the key, flat 3d, 4th of a ſharp key, 5th, flat 6th, flat 7th.

They which, as members of other chords, require the figures of harmony ſet over them, are theſe following; and are reduced to this general rule:

The 3d of every concord hath a $\frac{6}{3}$; and the 5th of every concord hath a $\frac{6}{4}$.

Therefore,		And theſe,	
Key Flat 3d and ſharp 5th of a flat key Flat 6th and ſharp Sharp 7th	have a $\frac{6}{3}$	Key 2d Flat 3d and ſharp 4th of a flat key 5th of a ſharp key Flat 7th	have a $\frac{6}{4}$

Laſtly, The 4th in a flat key, when it has its own chord, muſt have a 5th ſet over it, to diſtinguiſh the chord from that of the flat 7th. And the 6th in the ſharp key, when it hath its own chord, muſt have a 5th likewiſe ſet over it, to diſtinguiſh the chord from that of the 4th.

The proof of the 6th in a ſharp key, having for harmony its own concord, depends on the relative proportion of the flat and ſharp keys; as will be ſhewn in the chapter on tranſpoſition. So much for figuring the baſs in concords.

Let us now inquire into the ſhorteſt and cleareſt method of figuring the diſcords. This will be no difficult matter, when we conſider well the whole diſcords, as they are full figured in every example.

There the figures ſet over the baſs expreſs the intervals which the notes in the upper parts form with them. Theſe taken together make the whole diſcord. And as theſe, with the harmonic chords in ſucceſſion, expreſs the whole compoſition, they are therefore called the thorough-baſs.

To render the performance of the thorough-baſs eaſy and expeditious being the chief intention of figuring the baſs; this will be beſt anſwered by diſtinguiſhing the diſcords, which have ſome figures in common with each other, by ſuch figures only as will ſtrongly mark each diſcord. For though all the figures ſet down in the examples be neceſſary to demonſtrate the properties of the diſcords, and truth of the compoſition; the caſe is quite otherwiſe in reſpect to the ſight; many marks cauſing perplexity and confuſion, when one ſingle mark in this, as in all other caſes, beſt diſcovers the difference. The proper diſcords then being concords in themſelves, the figure, or figures, diſcording with the baſs note, will diſtinguiſh each of theſe.

The inharmonic diſcords being the ſame in different form, will be diſtinguiſhed by the diſcording figures peculiar to each form.

Of the properties of this diſcord, and manner of taking the ſame, we have ſpoken ſufficiently. We ſhall therefore only ſet down the diſcording figures of each form, in the following example.

Example of the proper diſcords figured for taking the ſame at ſight. No. 96.

The inharmonic diſcords figured for taking the ſame at ſight. No. 97.

Moreover, the proper diſcords being concords, each in itſelf; every diſcord will be concord to ſome note different from the baſs, or diſcordant note.

To remember this note will render the taking of this diſcord ready at ſight, it appearing in this light a chord of harmony.

The ſame is in ſome meaſure true of the inharmonic diſcord.

Therefore the figures in the examples, under the baſs lines, expreſs the names of theſe concords relative to each.

It remains to be obſerved, that the accompaniments of the 2d are the $\frac{6}{4}$, and of the 9th the ſharp $\frac{7}{3}$, as they appear in the natural order of the proportion of the ſame, (No. 82.) It will be neceſſary to demonſtrate here the truth of this.

The 4th and 6th being the accompaniments of the 2d, the fifth and ſharp 7th are the accompaniments of the 9th.

For the proportion of the 9th to the 2d (whoſe 8th it is) is 2 to 1. And the proportion of the 4th and 6th $\frac{15}{12}$. Therefore, by the rule of proportion, ſay,

as $1 : \frac{15}{12} :: 2 : \frac{10}{4}$:

but the 4th number, or $\frac{10}{4}$, is the proportion of the 5th and ſharp 7th; (for $\frac{1}{4}$ $\frac{7}{8}$, give $\frac{10}{4}$;) therefore the 5th, and ſharp 7th, are the accompaniments of the 9th. Q. E. D.

The laſt uſe we ſhall mention of the diſcord is the furniſhing the inward parts of muſick, in compoſition of many parts.

As, in harmony, each part of the four takes one of the concording notes, and hence, by the continual mixture of theſe by their contrary motion, the compoſition is framed; ſo, in figurate deſcant, the notes of the diſcord furniſh the parts in their turn.

And the ſame notes, paſſing by ſemitones chiefly, form among themſelves that reſolution which the baſs performs alone.

The compoſer therefore, when, ſetting a baſs, he introduces a diſcord, is as well prepared for the notes of the other parts in this caſe as in ſetting a concord; and if he be well ſkilled in the reſolutions, will with great eaſe compoſe the ſucceeding concord.

For the thorough baſs, being the whole compoſition in one view, the knowledge of the one and of the other muſt be the ſame. As, then, he who underſtands the rules of harmony and the diſcords, and their reſolutions, will ſucceed with eaſe in compoſition; ſo, on the other hand, he cannot be a ſkilful compoſer who is ignorant of the properties of harmonical chords and diſcords.

One example in three parts, being the ſame ſet above in two, will ſufficiently illuſtrate this.

Example of the uſe of diſcord in the compoſition of many parts. No. 98.

Chap. IV. Of MELODY.

Hitherto we have conſidered muſick in its ſeveral parts taken together, or the art of compoſition. Our next buſineſs will be inquire into the method of framing a ſingle part, or making the melody.

Melody.

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MELODY is the air of the uppermoſt or firſt part in muſick, commonly called the tune.

In a plain ſong, the air is formed without conſidering the relation which the other parts, which may be ſet in compoſition with it, may bear. For, being firſt framed, and for the ſole end of pleaſing the ear and fancy; it muſt, it is evident, be independent of them.

For as to framing the baſs firſt, and ſetting the treble to it, there appears no neceſſity either in reaſon or the rules of compoſition; they equally ſerving the purpoſe of beginning with any part, no part being privileged with any particular member of diſcord or harmony; as is abundantly manifeſt from the various poſitions which the diſcordant notes have been ſhewn to ſtand in; as well as from the 4th axiom of the theory, which eſtabliſhes variety for conducting and rendering even harmony acceptable; a ſameneſs in the ſucceſſive concords being the only thing exceptionable in that part of compoſition.

All the parts of muſick then being equally concerned in the compoſition; to prefer any one part, as a baſis, or unerring guide, on which to erect the muſick, or bring in the parts, is doing injury to that liberty which nature and the rules of art put us in poſſeſſion of.

But the air of the firſt part ſo eſſential to the tune, or rather the tune itſelf, compels us to decide in favour of framing the treble firſt. In which it will be found impoſſible to ſucceed, when it is confined to what the baſs, if it be firſt framed, muſt of neceſſity preſcribe.

This preference in framing the treble firſt, chiefly reſpects a plain ſong, or air. For, in more elaborate pieces, where the deſign of the author is imitation of paſſages in the ſeveral parts by turns, according to his choice or fancy making uſe of the ſame liberty, he will take any for the leading part, and accordingly write the paſſage in that part, and finiſh the compoſition in the reſt.

The air or firſt part in inſtrumental muſick is called the firſt treble; the air for a ſingle voice is called the voice part, or ſong; and in muſick for many voices, the upper part is called the counter-tenor.

In this muſick, the air of the tenor, and of every part performed by the voice, is ſtudied with more exactneſs than the inward parts of inſtrumental muſick.

The reaſon for this difference is, that in inſtrumental muſick, the firſt violin generally preſides, or leads the muſick by its air: as this is the compoſer's deſign, the other parts muſt of neceſſity be accommodated to it.

Whereas in muſick for voices, every voice repeating the ſame words, that is, expreſſing the ſame ſenſe, at the ſame time, or immediately ſucceeding; nothing can defeat the end of the muſick ſo much, which is the ſetting of words, or rather ſentiments, to notes as expreſſive of the ſenſe as inarticulate ſounds can poſſibly do, as for one part to excel the others ſo much in this neceſſary point, as by compariſon to depreciate, weaken, or alter the ſenſe in the others.

The air, therefore, of every part in vocal muſick muſt be conſulted; not only for the ſake of harmony, (for a good air in each part improves even the harmony,) but alſo for the ſentiment ſake, without which the muſick muſt be abſurd and diſſonant.

Notwithſtanding the liberty which every one may juſtly challenge of framing an air agreeable to his own fancy; yet it cannot be ſaid, that this liberty is uncontroulable, or beyond the power of art to preſcribe bounds to: For then indeed every ſtrain compoſed by even a bad and injudicious ear might ſtand in competition with the moſt finiſhed pieces. But as this will not be allowed on any hand, even an undiſtinguiſhing ear conceiving a degree of pleaſure in hearing good muſick; ſo there is no doubt but that there muſt be ſome precept or manner found out by experience, to aſcertain and conduct the air or ſtrain, and which will render it to a good and judicious ear plainly preferable.

The rules therefore which we ſhall lay down for melody, are ſuch only as are founded in truth and reaſon; the reſult of experience, joined to ſkill; and which are admitted in every liberal art: Theſe are unity, imitation, and order. If it ſhall be ſaid, that perſons unſkilled in muſick, but otherwiſe very capable from a natural good ear, will ſing an air which an artiſt cannot find fault with, we confeſs it may be in ſome ſort true.

But the ſtrains of ſuch compoſers are always very ſhort; and as they ſeldom or never depart from the key, ſo they afford not that variety ſo deſirable in muſick: Nay, what is this but ſaying that the rules of art are concluſions taken from nature, as in truth they are; ſo then they muſt be aſſuredly right? This muſt be ſo, when the appeal is made from art to nature.

As to thoſe eſſays called voluntaries, there was never a good one performed but by a good maſter. The muſick was always good in proportion to the maſter's ſkill in the art; in proportion to the variety he introduced according to the rules of art. Therefore even voluntaries are the effects of knowledge and deliberation.

But to return. The firſt rule of melody is unity.

The unity of tune is ſaid to be in reſpect of the key, and of the ſubject.

Every tune muſt be written in ſome key, in which it muſt begin and end.

As every air is ſaid to be in ſuch a key as is the laſt note, eſpecially the laſt note of the baſs; ſo there is the ſame neceſſity for the firſt and laſt note of every air to be ſome member of the concord of the key. This diſcovers the deſign of the author. Having thus fixed the attention of the hearer to this particular, the ear and imagination can no other way be ſatisfied than by holding to and executing the ſame deſign.

The unity of tune is as neceſſary in this reſpect, as conſiſtency in the words and ſentiments of an orator is requiſite to diſcover the ſcope and meaning of his diſcourſe.

Secondly, the unity of tune, in reſpect of the ſubject, ſignifies, that there ſhould be one ſubject of every piece of muſick repeated and inſiſted on, as often as conveniently can be, throughout the whole piece.

And this repetition will be in proportion to the length of the tune, and deſign of the compoſer. Even in a minuet, or any other exact piece confined to a certain number of bars, the repetition of the ſubject may be effected. Now, the ſubject of every air, or piece of muſick, is the firſt paſſage of the ſame, for any number of bars,

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bars, be they more or leſs, as it ſhall happen; every tune being ſtamped with ſome prevailing idea or fancy peculiar to itſelf, and therefore diſtinguiſhing it from every other.

The ſubjects of grand pieces of inſtrumental muſick are contrived with care and ſtudy; and invented with deſign to enlarge or deſcant upon at will; not being confined to any length, or certain number of bars. Such pieces, being the efforts of great and maſterly genius, afford all the pleaſure that deſign and invention, carried on by every maſterly ſtroke of art, can give.

The ſecond rule of melody is imitation. As in the executing other arts, a ſimilitude and proportion of the members ought to be preſerved; ſo imitation, or a repetition of the moſt ſtriking paſſages, anſwers to this in muſick.

Imitation may be performed many ways. Firſt, when the repetition of the paſſage is made, beginning on the note above the leading note of the paſſage; or on the third, fifth, eighth, or any other interval.

A paſſage alſo may be imitated in any of the deſcending notes. A repetition on the octave below is frequent in every good author.

In the repetition of paſſages, there are two varieties.

The firſt is, when the paſſage is repeated in notes belonging to the harmony of the key. It will ſeldom happen in this caſe, that the paſſage will in the repetition be preciſely the ſame, in reſpect of the intervals of the notes, though the movement be an exact imitation.

The reaſon of this will be evident, if we conſider that the intervals in both flat and ſharp keys reſpectively aſcend by different degrees; the ſemitone changing the intervals almoſt continually.

See example, No. 12. in the theory.

In theſe examples no more than two flat or ſharp thirds ſucceed each other. And where they do ſucceed, the ſemitone is in a different place in the two like intervals of flat thirds; it being the third of one interval, and 2d of the next aſcending 3d, or the contrary.

In the ſharp key, two ſharp 3ds aſcend from the 4th and 5th, and in the flat key from the 6th and 7th. The inequality of the flat 3ds, and of the few inſtances of their ſucceſſion, is owing to the places of the ſemitone.

To the inequality of the 3ds is owing the inequality of the 4ths, 5ths, and every other unequal interval in the courſe of the notes; the greater neceſſarily partaking of the inequality of the leſſer, which is included in it. All this is evident.

Therefore, the repetition of a paſſage will not be preciſely as the paſſage, except in the places abovementioned; that is to ſay, a repetition of ſharp thirds from the 4th and 5th of the ſharp key; and of the ſame, on the 6th and 7th of the flat key. And in the ſharp key, there may be an imitation in the compaſs of ſix notes aſcending; namely, from the key and its 5th. We have been particular in remarking the want of exactneſs in imitation on notes belonging to the key. Not that we mean to mark it as a defect; for it is beyond doubt, that every paſſage in the harmony of the key muſt be pleaſing, whether it be a perfect imitation or not.

Beſides, this diſſimilitude, ariſing from the place of the ſemitone being changed, is ſo far from being chargeable with a defect, that, as hath been often ſaid, it produces that ſweet variety which is founded in the principles, and which every artiſt purſuing will ſucceed in; as in this he doth no other than copy after nature.

Theſe remarks on the imitation of a paſſage in the notes of the harmony of the key, will lead us to the ſecond manner of imitation; which is ſuch, as that every note in the repetition ſtands exactly in the ſame interval reſpectively as the notes of the firſt paſſage.

This then is a perfect imitation. Which, as it cannot take place in the harmony of the key, except in the few caſes abovementioned, it muſt be effected by art; that is, by altering the places of the ſemitones in the key, ſo as to correſpond with thoſe in the original paſſage, by marking a ſharp for the ſemitone aſcending, if the repetition be in notes above the paſſage; and a flat for the ſemitone removed lower, if the repetition be in the deſcending notes.

In this manner there can be a perfect imitation of any paſſage of any length whatſoever, and of any compaſs: in every inſtance of which, the key is changed, by introducing notes not belonging to the harmony of the ſame.

As every interval of the firſt paſſage muſt be preſerved in the repetition: it will ſometimes happen, that many flats, or ſharps, muſt be added to the notes in the repetition. The rule of this practice will be well underſtood, when we ſhall have learned the art of tranſpoſition; the repetition of any paſſage in this manner being no other than a tranſpoſition of the ſame into another key. In regard to this perfect imitation, we have one remark: which is, that if a repetition be made on the note next above, and repeated again the note ſtill higher, it will have a good effect; for this will create ſuch a novelty in the ſtrain as is ſurpriſing; beſides that it affords the author an opportunity both of making new deſcant or enlarging on the ſubject in this new key, as well as of ſhewing the greateſt ſkill by returning from that digreſſion into the original key with art and propriety.

This will be no difficult matter to one who underſtands well the art of tranſpoſition. Now, the repetition of the ſubject tranſpoſed into a key different from the original belongs to this ſecond rule of melody; as the repeating the ſubject in its own key reſpects the rule of unity.

The repetition of the ſubject after theſe two manners, and throughout the ſeveral parts, as treble, baſs, tenor, and ſo on ſucceſſively and conſtantly, each part taking it up immediately, or as ſoon as the repetition is finiſhed in another, whereby the ſeveral parts ſeem to move in purſuit of each other, is called a fugue.

Muſick compoſed on this deſign is juſtly eſteemed above all other, not only on account of its excellent contrivance, but for the ſake of the pleaſure alſo which it affords.

In a juſt fugue is repreſented all the variety poſſible; at the ſame time that an uniform progreſſion of the parts is preſerved throughout the whole, without the leaſt diſcovery of the ſigns of art.

The reaſon for this may be, that the repetition of ſo intereſting a paſſage as the ſubject is, is ſo natural to the imagination

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imagination and ear, as not to be eaſily diſtinguiſhed as the effect of art. The conſtruction of a fugue will be underſtood, from this deſcription, to be in the following manner.

The ſubject being firſt written in that part which the compoſer intends to be the leading part, the ſame muſt be ſet down again in the next part wherein the repetition is appointed to be made, either in uniſon, or on the 4th or 5th to the key or ſubject, the 2d, or any other interval; in which matter the compoſer is at liberty.

Yet the repetition on the 4th ſeems more natural to the flat key; as, on the 5th, it is to the ſharp key.

If the muſick be in two parts only, the ſubject being written in each part in ſucceſſion; the next ſtep will be to frame deſcant to that part where the repetition is, and which therefore will be written in the leading part. Henceforward the parts move on at liberty, that is, no where repeating the ſubject, but expreſſing all the variety in deſcant each to the other, which the fancy, invention, and ſkill of the author ſuggeſt, until the ſubject is again repeated, either in the key, or ſome interval of the harmony of the key, or perhaps in a new key.

The imitation of this muſt immediately follow in the other part, in uniſon, or otherwiſe.

If the muſick be of three or four parts, let the ſubject be firſt written in every part, in ſucceſſion; and in the order you intend. Then fill up with deſcant the ſecond bar, or more, of the leading part; that is, as far as the ſubject reaches in the other part; and proceed likewiſe on the next repeating part with other new deſcant; and ſo on through every part, until all the ſtaves are equally full.

After which the parts move at liberty, as before in a two-part fugue, until another repetition of the ſubject.

But where, or how frequent, the repetition of the ſubject may be made; or on what interval, whether above or below; or by what ſucceſſion of the parts, (for they need not preſerve the order they began in;) is neither the buſineſs, nor in the compaſs of the rules of art to preſcribe.

In theſe matters, the compoſer is as much at liberty as his genius and invention can furniſh matter and variety. So that in ſome places the ſubject may be repeated continually, in the different parts, on intervals and in a key different from the original key or order.

Sometimes, the movement of the ſubject being the ſame, the notes are changed from aſcending to deſcending, or the contrary. Sometimes even the movement to the contrary. At other times, a new ſubject is introduced; and then it is called a double fugue. And laſtly, for the ſake of variety, the ſubject is repeated backwards, or inverted; ſo that the parts ſeem to paſs each other by contrary motion, inſtead of purſuing.

In a word, there is no paſſage which expreſſes variety, which may not be introduced in a juſt fugue; while the uniformity is preſerved in the imitation of the ſame, and reſuming the original ſubject, and key, towards the concluſion or cloſe of the piece.

We ſhall only add, that if the deſcant which fills up the bars be conſtantly written in all the parts ſucceſſively and in order throughout the whole piece, the fugue is, from the exactneſs of this repetition, called a canon. In framing of which, obſerve, that if the canon conſiſt of three or more parts; when the third part takes up the ſubject, the deſcant in the leading part muſt be part of the harmony of the other two.

What remains to be ſpoken to on this ſecond rule of melody, or imitation, is the method of returning into the original key, after a paſſage in a remote one. This will lead us to conſider the half-tones not belonging to the harmony of the key, or chromatic notes.

For if a paſſage, or repetition of a paſſage, be in a new key, which is the imitation we are now ſpeaking of, the reſuming the key immediately will be by chromatic notes; deſcending if the repetition were above; and if the repetition was in notes below the paſſage, we may aſcend into the key by chromatics likewiſe, or half-tones aſcending.

This is evident. For every key, flat or ſharp, having its ſemitones in their proper places, a paſſage is not in the key, when the ſemitones are out of their places.

Therefore the returning into the key, from a paſſage not in the harmony of the ſame, muſt be by removing the new half-tones.

This depends on the knowledge of tranſpoſition.

The new ſemitones introduced in a paſſage, or imitation of one, we have called chromatic notes; becauſe every ſemitone not belonging to the harmony of the key are to be found only in the chromatic ſcale.

Yet this is but improperly. For two, three, or more ſemitones ſucceeding each other are properly called chromatic notes; which, to muſick wherein the frequent uſe of theſe is made, gives the name of chromatic muſick.

The uſe of chromatic notes is to raiſe the attention by the uncommon and unexpected variety they produce.

For every new half-tone aſcending, being underſtood by the ear as the greater 7th, implies a new key. Three or more ſemitones aſcending after each other, do therefore raiſe the expectation of ſo many new keys: whereby the curioſity is greatly excited; and the expectation of the ear being gratified, in the imitation of a cloſe, by every new ſemitone, the muſick becomes, as in all other caſes where novelty takes place, truly the object of admiration. In a ſeries of ſemitones aſcending, the laſt is in the place of the key. When chromatic notes deſcend, the laſt but one is the key, for the ſame reaſon; namely, the ſemitone below ſounding as the greater 7th, every key being a ſemitone to its greater 7th or half-tone below relatively.

Chromatic notes aſcending, by alarming the ear and imagination, elevate the ſoul, thereby imitating the ſublime.

Chromatic notes deſcending, expreſs the pathetic, which is free from any alarm or terror. The performance of theſe notes ſhould always be with ſoftneſs, which naturally removes the apprehenſion of terror. Aſcending and deſcending ſemitones partake of the nature of the ſharp and flat keys; as hath been ſaid concerning the power of muſical ſounds to touch the paſſions.

Chromatic notes may be introduced in many places.

If, in a paſſage, the ſemitones of the key occur among others, they are to be accounted as chromatic. Therefore

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fore flat and ſharp keys are equally capable of improvement by them.

Notwithſtanding chromatic notes create ſo much variety and elegance, it muſt not be underſtood that they are to be introduced injudiciouſly, or without any addreſs; for then they would not only be uſeleſs, but injure the muſick. Chromatic notes being ſo affecting and expreſſive, as we have ſhewn, their place in vocal muſick will eaſily be determined by the ſentiment.

As, on the other hand, to introduce lively or pathetic ſounds, where the ſenſe is diſſonant from either, is introducing contradiction and confuſion.

Neither is it natural in inſtrumental muſick to break in upon a lively ſtrain by ſlowly-moving chromatic notes. Though at the end of a briſk movement, the tranſition is good. For muſic which moves in ſemitones, though quick notes, muſt appear ſlow to the ear, which expects the greater intervals of the diatonic ſcale, or whole tones.

Yet inſtrumental muſick does properly admit the mixture of chromatic notes, when they are accommodated to the genius of the ſtrain or ſubject. Neither will it be difficult to judge of this propriety. For muſical ſounds having a natural tendency to expreſs our ideas, the place of chromatics will readily be found by this mark; it being in the power of the compoſer to imagine ideas without the help or intervention of words, and ſo ſubſtitute theſe ideas in the place of words, and make them the ſubject of his ſtrain. Thus he may fill his mind with the imaginary paſſions of love, ſorrow, anger, dejection, pity, and the like; the expreſſions of which will be moſt eaſily diſtinguiſhed by muſical ſounds, and varied as the ſubject requires. Thus, if two or more of the paſſions, eſpecially contrary ones, be repreſented by turns, it will form in the imagination a kind of converſation between perſons, which never fails to ſtrike the attention ſtronger, and make a deep impreſſion on the hearer.

Beſides this, the imagination of the compoſer will be aſſiſted in the invention of variety; and the different paſſages of the piece will be furniſhed with notes proper and natural to each: for the ſame reaſon that choice and expreſſive words flow in upon a good writer who is maſter of his ſubject. We ſhall only add, that if ſometimes the different paſſages be allotted to the baſs and treble by turns, it will greatly diverſify the ſubject, mark the ſentiment ſtronger, and thereby cauſe new pleaſure. So much for chromatic notes. Notwithſtanding, what hath been ſaid in this place doth not reſpect chromatics only; but in general the whole proceſs of an elaborate piece, in every form and tranſition of the melody; wherein only there is opportunity for application of what we have here ſuggeſted.

The reaſon why we have given place to chromatics under this ſecond rule of melody, or imitation, we have already aſſigned; namely, that the uſe of half-tones is neceſſary where there is a repetition of a paſſage in another key. For, whatever proportion of ſounds is found in the natural order, the ſame may be transferred by art, and improved upon every occaſion, as thereby imitating nature. And this, by the way, is likewiſe the true reaſon for the reſolution of diſcords by ſemitones; being taken from the original pattern, or reſolution by the two ſemitones in the natural ſeries of ſounds in the octave.

The third rule of melody is order.

Order in muſick is the conducting the melody or air, according to a certain rule, through ſeveral intermediate cloſes, from the beginning to the final cloſe or end of the tune.

A cloſe is the termination of a paſſage in a concord; which, like a period in ſenſe, is framed with deſign, and from the preparation from the notes immediately preceding, which are the whole tone above, the half tone below, and the 5th (generally the baſs note) is expected by the ear. This is the deſcription of a full cloſe, which is ever the final cloſe, eſpecially of quick movements. This preparation is the concord of the 5th to the note on which the cloſe is made; the baſs making the great cadence, as we have taught in the rules of compoſition.

This preparation is in full harmony. But it muſt be remembered, that there is a preparation alſo from diſcord; chiefly the diſcord of the flat 7th, of which we have ſaid enough in the chapter of diſcord or figurate deſcant. In ſlow movements there is a preparation to a full cloſe; which ſhall be deſcribed preſently.

Every intermediate cloſe hath its preparation in imitation of the final cloſe, more or leſs. For there is no neceſſity for the parts taking invariably the ſame member of the chord; ſo that the treble oft times makes the cadence from the 5th, particularly in quick paſſages; in which likewiſe, in the middle of a ſtrain, many imperfect cloſes may occur, the parts taking the notes indiſcriminately as they happen, without any preparation deſigned. It is enough to mention theſe.

But in order to conduct the air in each ſtrain, if there be more ſtrains than one, with propriety and method, there muſt be a full cloſe in ſeveral places in the harmony of the key. Theſe are called proper cloſes.

Theſe are alſo cloſes made by the introduction of a new ſemitone, by the addition of a ſharp, making the greater 7th not belonging to the harmony of the key. Theſe are rightly called improper cloſes.

The places and order of both theſe we ſhall now aſſign.

The firſt proper cloſe falls naturally on the key. This is not meant of the final cloſe; for a cloſe may be made on the key, within a few bars of the beginning: yet this cloſe is ſeldom made, as not affording variety. Again, the firſt ſtrain ſometimes cloſes on the key: yet the cloſe of that ſtrain is more properly on the 5th; and the cloſe next after that on the 5th falls naturally on the key.

When a cloſe is made on the 5th, the 4th of the key being removed a ſemitone higher, becomes the greater 7th by the addition of a ſharp. For, in imitation of the final cloſe on the key, there muſt be a ſemitone aſcending.

Notwithſtanding, a cloſe made on the 5th, with a ſharp 3d always, from the chord of the 4th, in a flat key, without altering the 4th, or bringing in the greater 7th, is accounted an elegance: in which paſſage the baſs takes the flat 6th or 3d to the 4th, and thence deſcends by the ſemitone into the 5th.

This is never practiſed but in very ſlow movements.

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From the neceſſity of a ſemitone aſcending to every full cloſe, except this laſt inſtance, we draw this inference, That a cloſe may be made on every ſemitone in the key. This aſcertains the places in both flat and ſharp keys: in the cloſes of both which the key is a ſemitone; in a ſharp key, the 4th alſo; and in the flat key, the 3d and 6th.

Theſe are the places of proper cloſes, or ſuch as are made in the harmony of the key.

The order of cloſes is now to be conſidered, which, in a ſharp key, may be thus. The key, the 5th; the key, the 4th; the 5th, the key.

Notwithſtanding, every compoſer, being at liberty to purſue his own deſign, will prefer that order which will ſuit beſt with the manner of the air, or anſwer his intention. Our buſineſs is only to point out the places where cloſes may be made, and give a general idea of the order. For we have obſerved much difference in practice among the beſt authors; and indeed it cannot be otherwiſe in long and finiſhed pieces, conſidering that liberty inſeparable from every compoſer who invents; and therefore every manner which may increaſe variety, is to be recommended.

The order of cloſes, then, in the flat key may be, The key, the 3d the 5th, the key.

Or, the key, the 5th the 3d the 5th, the key.

Or again, the 5th the key, the 3d the 5th, the 3d the 6th, the 5th the key.

In pieces of a conſiderable length, cloſes may be repeated in theſe ſeveral places, and the ſucceſſion of them altered from that wherein we have ſet them down above.

Improper cloſes, or ſuch as are made on any other note than the key, flat 3d, 4th, in a ſharp key, 5th or 6th in a flat key, are made by bringing in a ſemitone not in the harmony of the key, by the addition of a flat or ſharp, the note below the new-made ſemitone being always the greater 7th, and which thereby determines the note on which the cloſe is to be made.

By this art a cloſe may be made on any note; as on the 2d, 3d, 6th, or 7th of a ſharp key; on the 2d, 4th, and flat 7th of a flat key. A cloſe on the 6th of a ſharp key is much in uſe, though no ſemitone: this depends on the 6th having for harmony its own chord, which will be proved in the next chapter.

It remains to be remarked, that as every new key is formed by the addition of a ſharp or flat; ſo the return into the former key, whether the original, or otherwiſe, is effected by taking off the flat or ſharp from that note, the next time it occurs in the courſe of the ſtrain.

In muſick of two parts, the greater 7th, or that which makes the new ſemitone, will not in every paſſage be expreſſed; the treble ſometimes deſcending from the 3d above into the cloſe. Yet, if the baſs falls the 5th, theſe two members of the chord do properly lead to the cloſe.

However, it muſt not be underſtood that in every cloſe the baſs muſt move the ſame way, by deſcending from the 5th, as was ſaid before; no part having any member of a chord proper to it by any neceſſary or natural dependance; for otherwiſe the ſecond treble, or tenor, could never aſcend above the firſt, nor the baſs above either; than which nothing is more common. Cuſtom indeed has appointed to the baſs this movement at a cloſe, for the moſt part, and eſpecially at a full or final cloſe: and juſtly; the deſcending from the 5th, being ſo intereſting a movement, is better expreſſed, as well as more ſuitable to the grave notes of an inſtrument performing the baſs.

There is another paſſage in practice, which, though not a cloſe, yet comes properly in this place to be ſpoken of. It is a ſudden or unexpected ſtop of all the parts made on a diſcord.

As this is generally practiſed in quick movements; ſo it is often, though not always, ſucceeded by a ſlow movement: during this ſtop, the ear is held in ſuſpenſe by the diſcord, and waits for the reſolution into the concord.

The ſuddenneſs and novelty of this paſſage recommend it. It ſeems contrary to a cloſe: for as, being a diſcord, it hath no preparation, and, not being reſolved as ſoon as the ear expects, ſeems to loſe its connection with the following chord; its meaning therefore is undetermined, and the ſenſe confuſed: yet it hath a good effect by alarming the imagination, reſembling an affected perturbation in the order of the words and ſentences of an oration.

Chap. V. Of TRANSPOSITION.

Transposition is the removing a tune from one key into another. The uſe of tranſpoſing is to bring a tune within the compaſs of ſome inſtrument, or for the more eaſy performance on an inſtrument; ſome keys being more difficult to perform in than others; eſpecially in wind inſtruments, as the German flute, *&c.* For as to inſtruments that are ſtopped, as the violin and baſs-viol; and inſtruments with keys, as the organ and harpſichord; all keys are eaſy to a good performer, who is ſaid to be maſter of the ſcale of the inſtrument.

Secondly, Tranſpoſition is abſolutely neceſſary in muſick for voices and inſtruments, when it happens that the key in which the muſick is written is too high or too low for one or more of the voices. In this caſe, the muſick muſt be tranſpoſed for the inſtruments into the key which is neareſt to and will beſt ſuit the pitch and compaſs of the voice. For as to the vocal performer, it matters not in what key the muſick be written for his part, provided he can ſing in the cliff, (or indeed, if he can tranſpoſe, as ſhall be taught in the laſt chapter, Of ſinging by note, whether he can ſing in the cliff before him, or not,) if the inſtrument be accommodated to his voice.

There are two ways of tranſpoſing. The firſt is, when the tune is written in another key, at any diſtance above or below the original, with the proper flats or ſharps prefixed. When this is done, the performance on the inſtrument is eaſy; the half-tones of the key, and every other, keeping their due places expreſſed in the writing. This may be called tranſpoſition by writing.

The other method of tranſpoſing is by the cliff; that is to ſay, when the cliff is removed, or ſuppoſed to be removed, from the place wherein it ſtands prefixed to the tune.

This removal of the cliff at once tranſpoſes the whole, without alteration of the writing; the uſe of the cliff being, as hath been ſaid, to aſcertain the names of the notes. We ſhall ſhew both theſe methods of tranſpoſition; and firſt of tranſpoſition by writing.

Tranſpoſition

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Tranſpoſition, in general, is writing or playing a tune in a different key from that wherein it is written, preſerving the places of all the ſemitones.

If the notes in the ſcale of muſick expreſſed no other than whole tones, tranſpoſition would be evident to ſight. For a ſeries of tones at equal intervals would, when removed to any diſtance or interval, preſerve their places of themſelves (ſo to ſpeak,) or without the help of art. And the performance of the ſame on an inſtrument would be equally eaſy in all keys; no alteration happening thereby, but changing the names of the notes. And even this would be unneceſſary.

The ſemitones therefore are the cauſes of any obliquity in the ſcale of tranſpoſition; and therefore the keeping them in their due places is the art we are now ſpeaking of. As it is ſaid in the theory, they are the foundation of writing the ſame tune in divers keys, which is tranſpoſition.

We muſt have recourſe therefore to what hath been ſaid in the theory concerning the eſſential difference of tune, or the different places of the ſemitone.

When the firſt ſemitone above the key is on the 4th, or 6 ſemitones to the key; the 3d, which is 5 ſemitones, is the greater, or ſharp 3d; and the tune is from hence ſaid to be in a ſharp key.

Again, when the firſt ſemitone above the key is on the 3d, or is 4 ſemitones to the key, that being the leſſer or flat 3d, the tune is in a flat key. Again, the next ſemitone in the ſharp key is the 8th; and in the flat key on the 6th.

In every ſharp key, the ſemitone muſt ſtand in the ſame places, that is, the 4th and 8th; and in the flat key, in the 3d and 6th.

The name of the ſharp key in the ſcale, whoſe ſemitones are in their places without the addition of flat or ſharp, is C. Hence C is called the naturally ſharp key. Its ſemitones are F and C.

This is the pattern for tranſpoſing in all ſharp keys: chiefly by remembering the letters or names of the ſemitodes.

The key in the ſcale, whoſe ſemitones are in their places without the addition of flat or ſharp, is A. Hence this is called the naturally flat key. Its ſemitones are C and F. This is the pattern for tranſpoſing in all flat keys; remembering the names of the ſemitones.

It may be required to tranſpoſe from any key with a ſharp 3d, into any other of the ſame; or likewiſe from any flat key reſpectively. Notwithſtanding, we ſhall proceed, according to our method, to ſhew what are the keys in the natural ſucceſſion into which a tune will be tranſpoſed, beginning at C the naturally ſharp key. As the properties of every key will be diſcovered by this method; ſo it will anſwer every thing that can be required in tranſpoſition; or ſhew how a tune may immediately be tranſpoſed from any key into any other interval or key that may be required.

For inſtance, let it be required to tranſpoſe from the key of C into that which is next in the natural order of tranſpoſition. F is the firſt ſemitone in the key of C; which, by the addition of a ſharp, becomes F ſharp, and conſequently the greater 7th to the ſemitone above it, which is G. Therefore G is the new key into which the tune is tranſpoſed. No. 99. For,

Again, let it be required to find the next key to be tranſpoſed into, from the former, or G.

The firſt ſemitone in the key of G is C: which by the addition of a ſharp, which is removing the ſemitone, becomes C ſharp, or the greater 7th: therefore the new key is D. No. 100. For,

Obſerve that every former ſharp which is ſet down for the tune tranſpoſed, is included in every ſucceeding tranſpoſition. That is to ſay, C, for inſtance, cannot be marked ſharp, unleſs alſo F be marked.

The reaſon of proportion demonſtrates this to ſight. Theſe are the two ſemitones of the open keys, as they are termed; the obſervation will hold true of all others, as will be ſeen in the following inſtances.

To tranſpoſe out of D into the next key; the firſt ſemitone in the key of D is G. But G ſharp is the greater 7th to A. Therefore A is the new key. No. 101.

Take notice, that the firſt ſemitone, or 4th in the ſharp key, being removed by the addition of a ſharp; the tune is hereby tranſpoſed into the 5th to the key.

This removal into the 5th, by changing the firſt ſemitone, being the ſame in all ſharp keys, it need not be repeated in more examples. For the next to A will conſequently be E, with the addition of A ſharp to D.

The next B with A ſharp.

The next will be F ſharp with E ſharp; never uſed.

The next would be C ſharp with B ſharp; never uſed.

The next would be G ſharp with F having two ſharps; never uſed.

The next is D ſharp, with C having two ſharps; which laſt is D natural. This key is in frequent uſe: but the name of the key is changed, and marked with its equivalent E flat: and the name of its greater 7th is likewiſe changed; and, inſtead of C having two ſharps, is left, as in truth it is, D natural.

The next is B flat; its greater 7th A natural.

The next is F natural; its greater 7th E natural. From this we aſcend, according to the rule, by a 5th into C where we began.

Hence it is evident, that of the twelve ſemitones in the octave, nine are in uſe as keys with a ſharp 3d.

Of which the following are examples in their order. No. 102.

The laſt three examples marked with flats may be demonſtrated in another manner; which is, by changing the place of the other ſemitone, or 8th, by removing the ſharp 7th, by prefixing to it a flat. The tranſpoſition will, by this alteration, happen in an inverted order from that in the foregoing examples. For, as the 4th or firſt ſemitone in the former manner, being removed by the addition of a ſharp, became the greater 7th; ſo in this caſe, the greater 7th being removed by prefixing a flat to it, becomes the 4th of the next key. No. 103.

This manner of demonſtrating the laſt three keys is preferable. For, by changing the firſt ſemitone, as in the former manner, it doth not ſo plainly appear, as that depends upon the foregoing key, which never was in uſe. Beſides, the number of ſharps to be prefixed to theſe keys might perplex a beginner in tranſpoſing; whereas the

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flats, as prefixed in the example, do more methodically follow the removing the greater 7th by a flat.

The demonſtration is equally certain and clear in both manners. Let it be remembered, that in tranſpoſing, by altering the greater 7th, the key is removed to the 4th above.

Let us proceed to tranſpoſition in a flat key: the general rule of which is the ſame as for the ſharp, to remove the ſemitones, and thereby preſerve the proportion of the key.

The different places of the ſemitone will cauſe ſome variation in the effect, or interval of tranſpoſition.

Let it be required, according to our method, to tranſpoſe out of the open or naturally flat key A, into that which is next by natural ſucceſſion.

The firſt ſemitone in the key of A is the 3d, or C; which, by the addition of a ſharp, becomes the greater 7th: wherefore, the new key, or that into which the tune will be tranſpoſed, is D. No. 104. For,

Let it be remarked, that the greater 7th which determines the new key in this as well as in the ſharp key, is never prefixed to the tune; which to the ſharp key always is.

The reaſon is, that the flat 7th is the property of the flat key. To prefix therefore a ſharp to the place of this note on the ſtave, or beginning of the tune, would be a conſtant contradiction to all the flat 7ths that may occur throughout the whole air. But the ſharp 7th, when brought in at a cloſe, middle or final, or elſewhere where there is no cloſe, is marked particularly as occaſion requires.

Another reaſon for not prefixing a ſharp on the ſtave to the place of the 7th of a flat key is, that, in ſome keys, the 6th muſt have its flat ſet on the ſtave, or beginning of the writing: a ſharp, then, on the place of the 7th would appear a contradiction to ſight, and ought therefore to be avoided.

The removal by tranſpoſition in the flat key being always to the 4th above, as in the laſt example, there needs no other example at length of tranſpoſition in this key, the ſame proportion obtaining throughout every key with a flat 3d reſpectively.

According, then, to this proportion, the next key after D will be G; the 3d of the former, or F natural, becoming F ſharp the greater 7th, E flat its 6th.

The next will be C. Its greater 7th is B natural, with the addition of a flat to A its 6th.

The next will be F, with the addition of a flat to D its 6th.

The next would be B flat, with the addition of a flat to G its 6th, never uſed.

The next would be E flat, with the addition of C flat its 6th, never uſed.

The next would be A flat, with the addition of a flat to F its 6th, never uſed.

The next would be D flat, with the addition of two flats to B, never uſed.

The next would be F ſharp, its 6th D, never uſed.

The next is B, its greater 7th A ſharp.

The next is E, from whence we aſcend by a 4th into the firſt key A.

Hence it is plain there are ſeven flat keys in uſe, out of the twelve ſemitones in the octave. Of which the following are examples, with their proper ſigns prefixed. No. 104.

It may be obſerved, that by changing the place of the other ſemitone or 6th, by adding a ſharp, the tranſpoſition is by two degrees of the former at once; as from A into G, and ſo on. But this is no more that what hath been done in the ſecond ſtep of this example; yet by putting this ſharp to the 6th, it is a ſhort way of tranſpoſing into the whole tone below.

It appears from hence, that there are in all ſixteen keys in uſe; a fund for great variety: among which you will obſerve, that ſome ſharp keys have flats prefixed, and ſome flat keys have ſharps; which cannot by this time appear ſtrange to one who perceives the neceſſity of preſerving the proportion of each, and who muſt now underſtand the truth of the 3d axiom of the practice, That no tune compoſed in a ſharp key can be tranſpoſed into a flat one, nor a flat one into a ſharp; for that would be altering the permanent nature of things.

From compariſon of the examples, will be ſeen what is moſt worthy of remarking; which is, That whatever ſharps or flats belong to any flat key, the ſame are likewiſe the property of that ſharp key, which is on the ſame flat key's 3d: for inſtance. A with a flat 3d, and C with a ſharp 3d; ſo D and F, G and B; and ſo of all others reſpectively having the ſame ſigns belonging to and prefixed to each.

Hence we collect, that the eſſential difference of tune conſiſts in the form, that is, the poſition of the ſemitone, and not in the materials of muſick.

A truth which appeared before in the compariſon of diſcord with harmony; and which will be of great ſervice hereafter, in the art of learning to ſing by note.

This inference furniſhes us with a proof of the 4th of a flat key, and 6th of a ſharp key, having for harmony each his own concord.

A proof which was wanting; as it could not be had from the rules of harmony, neither of theſe intervals being in the place of a ſemitone. The general theorem is this: As by axiom 2d the proportion of one ſingle ſound is to another according to the natural order of ſounds; ſo the proportion of one chord to another will be according to the natural ſucceſſion of chords. For a chord is no other than an unity of ſounds. But it appears that the ſucceſſion of chords by tranſpoſition in the flat key, is by 4ths, that is, the chord of a note, with a flat 3d; and that of the note's 4th is the ſame. Now, the harmony of the key or given note is the concord of itſelf: therefore the harmony of the 4th in a flat key is the concord of itſelf.

In like manner we demonſtrate the harmony of the 6th of a ſharp key to be the chord of the ſame.

And in this the proof lies nearer the truth than in the former caſe.

For the chord or proportion here is not only the ſame, but the individual ſounds.

For as by compariſon, as above, of any flat key with the key of its 3d (which muſt ever be a ſharp key, the flat and ſharp 3ds being the compound intervals of the 5th) the

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the properties and proportions are not only like, but the ſame, the difference conſiſting in the form or place of the ſemitone; ſo the chord of one key will be to the chord of the other, not only like, but the ſame. Now the harmony of every flat key is, by the the rules of harmony, the concord of itſelf: but the concord of the flat key is the relative ſharp key's 6th; therefore the harmony or chord of the ſharp key's 6th is the concord of itſelf.

Let us now apply theſe rules of tranſpoſition to the ſecond rule of melody, or perfect imitation, which is the repetition of a paſſage in notes not belonging to the harmony of the key; by which notes we underſtand all that have a ſharp or flat added, which was not prefixed to the beginning of the ſtave or tune.

The general rule of which is, Firſt name the key in which the paſſage is written, whether the ſame be the original key, or that of the tune, or ſome other; then name the interval of the firſt note of the paſſage to the ſame key.

Whatever interval the imitation begins on, whether a 2d, 3d, 4th, 5th, or any other above or below the paſſage, it bears the ſame proportion to the key of the imitation as the firſt note of the paſſage to its key. Thus

G is to C as A is to D, or
G : C :: B : E, or again
D : A :: B : F, or
D : B :: E : C.

The leading note and key being thus expreſſed, both of the paſſage and imitation, ſhews the proportion of the imitation above or below paſſage.

If the paſſage be in a ſharp 3d, as the imitation muſt be ſo too, the ſigns, as prefixed to one of the examples of the ſharp keys, will be required to be added to the notes of the imitation; and if the paſſage move with a flat 3d, the examples of the flat key diſcover the marks wanting in the repetition.

Thus G, the leading note of a paſſage in C, with a ſharp 3d, repeated in the note above; as A and D require two ſharps, namely on F and C, the property of D with a ſharp 3d.

And the ſame paſſage in C with a flat 3d, will in the note above require B marked flat, the property of D with a flat 3d:

And G C ſharp 3d, tranſpoſed into a 3d, or B E, requires four ſharps, on F, C, G, and D, the properties of E with a ſharp 3d.

The ſame paſſage with a flat 3d, or any other paſſage, will, when tranſpoſed into E, require but one ſharp on F:

And D B, with a ſharp 3d repeated in E C the natural ſharp key, require neither ſharp nor flat.

But the ſame, or any other paſſage with a flat 3d, will, when tranſpoſed into C, have three flats on B, E, and A, the property of C with a flat 3d: and if there be no leading note, as it may often happen, nothing more is to be conſidered than the key.

Thus the uſe of tranſpoſition in perfect imitation is evident.

The ſecond method of tranſpoſition is by the cliff.

The uſe of the cliff is to aſcertain the names of the notes. Therefore, the names of the notes will be changed by removal of the cliff.

Now as, in tranſpoſing, it is neceſſary that every interval be preſerved, or that the ſemitones keep their due places; ſo by altering the name of the firſt note of the tune, by removing the cliff, all the other notes are altered in proportion.

Thus the removal of the cliff effects at once what was done in the other method by the tranſpoſition of every ſingle note of the tune by writing.

This way is eaſier to the writer, but much more difficult to the performer.

Inaſmuch as a confirmed habit in any thing is harder to be changed for a new method, than it is to learn by a certain rule at firſt.

Therefore the performance in tranſpoſition by the cliff can no otherwiſe be attained, than by conſtant and repeated practice in all the cliffs, and in all ſuch places as they are uſed to be ſet for convenience.

Every one therefore who deſires to become a maſter in performance, after he is well acquainted with the three cliffs in their uſual places, ought to accuſtom himſelf to perform in every cliff, in whatever place it may be ſet. This knowledge will not only render the performance convenient to his private amuſement, by the variety with which he can furniſh himſelf, by playing the ſame air in whatever key he pleaſes; but will alſo make him an uſeful member in a concert, by tranſpoſing at ſight, whenever it may be required to accommodate the inſtrument to the voice. For let it be underſtood, that to him who is ſo well acquainted with the places of the cliffs, as to perform in any of them at ſight, nothing more is wanting to his tranſpoſing by the cliff at ſight than to imagine the cliff is prefixed to ſuch or ſuch a place, and commit to his memory the name of the key n which he is to perform, by tranſpoſing according to the removal of the cliff which may be moſt convenient.

This will fix the places of the ſemitones, or aſſign the ſharps or flats belonging to the new key, as they are ſet in the example in the firſt method of tranſpoſing by the writing.

Any of the cliffs may be removed; yet the C cliff or tenor is moſt commonly in uſe for this purpoſe.

The general rule for tranſpoſition by the cliff is this.

To tranſpoſe into any interval above the key, remove the cliff by the ſame interval deſcending. And if the inſtrument be too high for the voice, to tranſpoſe into a lower key, remove the cliff to a convenient interval higher.

For, raiſing the cliff depreſſes the notes; and, contrary, ſetting the cliff lower raiſes the notes, or tranſpoſes them into a higher key, in proportion.

Chap. VI. Of SINGING by NOTE.

The art of ſignging by note is founded on the principles and practice of muſick. Therefore we have reſerved this ſubject to the laſt.

To ſing by note ſeems in ſome reſpects more difficult to attain than performance on ſome inſtruments. In other reſpects, it is eaſier and ſooner acquired.

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The more time is laid out on the practice on ſome inſtruments, the more difficult the execution grows, in ſome ſenſe, that is, according to the conſtruction and compaſs of the inſtrument. On the contrary, all the difficulties in learning to ſing by note preſent themſelves in the beginning, in appearance greater than they really are; and which a knowledge of the principles of muſick, and a little of the practice, with a tolerable good ear, will with eaſe overcome.

Beſides, a little time and experience will convince any one of what compaſs his voice is, and what degree of performance he is capable of attaining. The principles of ſinging therefore being well underſtood, there remains no further difficulty; no one having a right to expect he can execute more than what is within his natural powers.

If this art is not ſo commonly underſtood, or the knowledge of it ſought, it may be owing to this, that the precepts for learning, or the manner invented, and conſtantly uſed, are more perplexed than the ſubject demands.

How far this may be true, will appear from an obſervation or two which we ſhall make on the method now in uſe.

The art of ſinging by note reſts on theſe two principles; the finding the places of the ſemitones, and tuning them and the whole tones of the octave aright.

The firſt of theſe has been delivered in the theory; and alſo in the practice, under the laſt article Tranſpoſition. The tuning the notes is the ſubject we are now engaged in.

Let us firſt examine how far theſe have been proſecuted in the preſent method.

The notes of the octave, beſides their names in the ſcale, have been uſed to be diſtinguiſhed by theſe four ſyllable, Sol, la, mi, fa; acommodated to the purpoſe of ſinging by note, in the following order.

Fa. ſol, la, mi, fa, ſol, la.

Whereof Sol being thrice repeated in the octave, La twice, Fa twice, and Mi once; four ſyllables expreſs the 8 notes.

The art of tuning by theſe, or aſſigning the places of the ſemitones, is by appointing to Mi the place of the greater 7th; and then Fa immediately following expreſſes the ſemitone or key, and the other Fa the 4th. How well ſoever this may anſwer the purpoſe of tuning the half-tones in a ſharp key; yet in a flat key, the places of the half-tones being the 3d and 6th, will, according to to this order, be expreſſed by La, the ſemitone ſyllable Fa conſequently expreſſing whole tones.

To obviate this difficulty, and reduce things to order, another place of Mi muſt be aſſigned, which is the 2d of a flat key: for this Fa will expreſs the ſemitones on the 3d and 6th.

It is evident then, that before any half-tone or whole-tone can be tuned, the firſt buſineſs muſt be to find out the place of this mi: now how this can be done by virtue of the ſound, or name, or order of theſe ſyllables, is not ſo eaſy to comprehend.

But admitting the place of mi, or the key, to be known by ſome previous precept, as indeed ought to be; yet tuning the key as the firſt ſemitone in a ſharp 3d, and the 3d as the firſt ſemitone in a flat key, is beginning at the wrong end in the firſt caſe, and thereby not marking the eſſential difference of tune, which conſiſts in the flat and ſharp 3ds, the order of which is diſturbed by this variation of the place of mi.

From this want of marking the eſſential difference in tuning by theſe ſyllables, and wherein the beginning and ending is not on the key, ſome confuſion and much trouble and untunableneſs muſt ariſe. And indeed it cannot be imagined, that this or any other eſſential difference of things can be marked by the ſame invariable artificial ſigns, if they be not exactly accommodated to the nature of things. An invention that fails in this, however ingenious it may be in ſpeculation, not being a juſt repreſentation of nature, doth not merit the name of art.

For inſtance, if you tune eight notes, whoſe key hath a ſharp 3d beginning on the 5th, your ſeventh note, which is the 4th of the key, and therefore a whole tone from the ſucceeding note, will ſound like the flat 7th. Again, if you begin to tune on the 2d, your 3d, which is the 4th of the key, is flat; and the ſound in this ſucceſſion will appear as if you were tuning in a flat key.

And again, if you tune from the 6th, the deception of a flat 3d is the ſame as in the laſt caſe.

Secondly, if you tune 8 notes whoſe key hath a flat 3d, and begin on the 7th, your 3d, which is the 2d of the key, is ſharp, and your tuning will be as if in a ſharp key.

The ſame deception will appear if you begin to tune on the 3d or 6th.

In a word, whatever other interval you begin on, to tune either with flat or ſharp 3d except the key, ſome ſemitones will be out of their places: This is rendering what is at firſt ſight attended with ſome difficulty, more perplexed and obſcure.

The ear, the judge of ſounds, is deceived, and the judgment miſled.

But on the other hand, the ear will naturally and eaſily diſtinguiſh the flat and ſharp key, when the key and its 3d are aſcertained by beginning and ending on the key.

But otherwiſe, and where theſe marks are promiſcuouſly uſed, the difference of tune, or infallible ſign, will appear neither to the ear nor underſtanding.

We ſhall end theſe remarks with one general obſervation; which is, that by aſſigning the place of mi to the greater 7th or 2d, in order to find out the key, is reſolving one difficulty by a greater, and requiring to do a thing without any means of information offered to compaſs it.

For as it is true that when the greater 7th or 2d is known, the key is known alſo, and again, the key being given, you have conſequently the 7th or 2d; yet to do either of theſe, without ſome intermediate helps, is taking for known the thing ſought, which is directly contrary to reaſon.

Proceed we now to our method of ſinging by note.

The firſt principle of ſinging, is the finding the places of the two ſemitones in the octave, in any given key

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This hath been pointed out in general, in the theory, where are ſhewn the places of the ſemitones in the ſharp key to be the 4th and 8th, and in the flat key the 3d and 6th.

But the particular names of the notes, on which the ſemitones fall in any key whatſoever, and which it is evident muſt depend on the name of the key, are demonſtrated, and examples given, in the practice, under the article of Tranſpoſition.

We ſhall therefore transfer only the examples into this place, in a conciſe order, which will fully anſwer our inquiry into the names and places of the ſemitones.

The nine ſharp keys. No. 106.

The ſeven flat keys. No. 107.

By theſe examples the particular names of all the ſemitones are known at ſight; as they depend on the name of the key.

Therefore in the example of the ſharp keys; the firſt key being C, the ſemitones are F and C.

The ſecond G; the ſemitones C and G.

The third D; the ſemitones G and D, the 4th and 8th of each reſpectively.

In the example of the flat keys; the firſt being A, the ſemitones are C and F.

The ſecond D; the ſemitones are F and B flat.

The third G; the ſemitones B flat and E flat. And ſo on, the 3ds and 6ths reſpectively.

To apply this to the purpoſe of tuning the notes by the voice: At ſight of the ſharps or flats prefixed to the tune to be ſung, and looking at the key-note, you have of courſe the places of the ſemitones, by referring theſe to the original in the examples ſet above.

Having thus diſcovered the difference of tune, you are at the ſame time determined whether you are to tune the notes of the octave with a flat or ſharp 3d.

This tuning of the eight notes, tones and ſemitones, in their due order, is the firſt ſtep or principle of tuning all other intervals, or of ſinging by note.

It will moſt readily be learned by imitating another voice, or following the notes of an inſtrument; this is the only caſe wherein there is need of any foreign aſſiſtance to ſinging by note.

The inſtrument we would recommend for this purpoſe is the organ or harpſichord; as the 4 or 5 ſemitones, which aſcertain the flat or ſharp 3d, ſucceeding each other, being viſible on the keys of that inſtrument in any part, the learner can in this caſe aſſiſt himſelf, by ſtriking the notes of the octave in either flat or ſharp key, on any part of the inſtrument which will beſt ſuit the pitch of his voice, and diſtinctly repeating them by turns, until his ear is become a perfect judge of the difference of the flat and ſharp 3d, as well deſcending as aſcending, and his voice perfect in tuning both.

As muſical ſounds will be beſt expreſſed in tuning by articulate ones; we ſhall, to anſwer this convenience, take the four ſyllables already in uſe.

As we ſhall apply them to another purpoſe than they ſerve at preſent; ſo the order or manner we ſhall diſpoſe them in, will be altogether different from that.

In tuning, then, the notes of the octave with the inſtrument, let the ſyllables be expreſſed with the notes, in the order of the following examples.

In G ſharp. No. 108.

Now, ſince the flats or ſharps adjuſting the ſemitones of any ſharp key are exactly the ſame which belong to the flat key reſpectively on the 6th, as we have ſaid before in comparing the examples of flat and ſharp keys in tranſpoſition; therefore the eight notes aſcending in a flat key will have the ſyllables annexed to each, as in the following example on the 6th, without diſturbing or departing from the order of the ſharp.

In E flat. No. 109.

The ſemitones and the tones below them being diſtinguiſhed by the ſyllables fa and mi, in their reſpective places in both keys, for deſcending as well as aſcending notes, is the ſole uſe we intend by theſe ſyllables; the tuning of the notes, which is to be learned by the inſtrument, being entirely independent of them.

For tuning the deſcending notes then, there need no other examples than the two above written; for reading the ſame backwards will ſerve this purpoſe.

When the ear becomes well acquainted with tuning the notes of the octave by the inſtrument, it will then be proper to ſing the ſame looking on the notes written on the book; and this ſhould be done in every example of both keys. And let it be remembered, that tuning the notes thus in the natural order, ſhould be to a beginner the prelude to ſinging any ſong propoſed.

The next ſtep will be, before the learner attempts to ſing any part of a ſong, to tune by the notes the greater intervals, both concord and diſcord.

The general rule for which is, Tune all the notes of the interval in the natural order, aſcending if the interval aſcend, and deſcending if the intervale deſcend. Then immediately tune both notes of the interval, beginning with the concords.

Thus. No. 110.

Concords in ſucceſſion.

The diſcords are. No. 111.

The ſemitone being the diſtance between the 3d and 4th, is already known by tuning the notes of this interval.

Note, The name of every greater 7th introduced by a ſharp prefixed, is mi.

Next tune the concords of the thirds in ſucceſſion. In this manner. No. 112.

The 4ths and 5ths being all perfect and like, except one of each, need no repetition.

The 6ths in ſucceſſion are tuned thus. No 113.

Laſtly, mix the diſcords and concords as they ſtand in the natural order; than which nothing will better confirm the juſt tuning of the intervals, when theſe rules are to be applied to future practice.

In this manner. No. 114.

This line may be tuned various ways; as, ſecondly, beginning ſtill on the left hand, tune the 3d and 2d notes, reading backwards; and ſo on, each two under the ſlur.

Again, beginning on the right hand, tune the uppermoſt note and ſecond downwards; then the firſt and third; and

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ſo on, ſtill miſſing one, and omitting conſtantly the G, or key not below.

And laſtly, beginning ſtill on the right hand, tune the ſecond and firſt, the third and firſt, the fourth and firſt, and ſo on, omitting the G or key-note conſtantly.

The practice of tuning the notes deſcending of all theſe examples, is by reading the ſame backwards.

The tuning the greater intervals in the flat key depending in like manner on tuning the eight notes in ſucceſſion, according to that ſeries; it is unneceſſary to ſet examples of the ſame.

The ſame method of practice equally ſerving this key, except that the ſyllables annexed to this key muſt be repeated, as in the proper example 109.

As in this example of the intervals of the 3d, 6th, and 7th, wherein this key differs from the ſharp. No. 115.

The general rule of tuning the intermediate notes of each interval firſt likewiſe taking place here.

In order to eſtabliſh theſe rules in the memory, and render them of immediate ſervice to the practitioner, eſpecial notice muſt be taken of the flat and ſharp thirds, as alſo of the flat and ſharp ſixths, in what places they ſtand, or how they ſucceed each other in the order of the key.

The not attending to theſe differences being the only obſtacle that can ſtand in the way of ſinging at ſight, ſee them ſet down at large in the theory, and in the examples of this chapter, No. 112, 113.

When theſe are well recorded in the memory, together with the ſharp 4th or flat 5th, the art of ſinging by note will not appear ſo myſterious. This knowledge of the intervals at ſight will render the ſyllables of little or no uſe, as hath been obſerved, and eſpecially if words be ſet to the airs you intend to practice; which we would adviſe.

When the interval of each note is known at ſight by conſtant practice, and the ſound of every interval become familiar to the ear, and thereby diſtinguiſhed immmediately upon hearing the ſame, the learner may make an eſſay to ſing by note ſome plain ſong; which is no more than tuning the ſame intervals, with which he is ſuppoſed to be well acquainted in the foregoing leſſons.

For as to any other article of knowledge requiſite to the performance of the ſong; as the time of the movement, and lengths of the notes, and the like; if the practitioner hath not been acquainted with them by practice on ſome inſtrument beforehand, the principles of them have been delivered in few words in the introduction to this eſſay.

But beſides that this is not the place for ſpeaking of theſe matters, ſo neither is there occaſion for this knowledge in the very beginning, in ſtrictneſs of ſpeaking; it being adviſable for a beginner to ſtudy the tuning the intervals of the ſong, without reſpect to any other affection of the ſounds; and when he is maſter of this, to add the practice of the lengths of the notes, as a ſecond conſideration.

We ſhall here ſet the notes of a plain ſong, in order to make ſuch application of the rules as may be an introduction towards the further execution of them. No. 116.

Firſt, find out the key, by looking at the laſt or key note; then ſee whether it hath a flat or ſharp 3d.

The key of this example being G, with one ſharp prefixed, is a ſharp key; being the ſecond inſtance in the examples of the nine ſharp keys.

Therefore tune the notes of the octave aſcending, and deſcending, in a ſharp 3d. Immediately after tune the concords in ſucceſſion. After that, tune the concords of the 3ds, aſcending and deſcending. This will be prelude enough for fixing your attention and ear to the 3ds of the key, and for pitching your voice. Having repeated this two or three times, begin the ſong in the ſame pitch or key wherein you ſung the prelude. For nothing contributes more to ſinging in tune, than frequent repetition of notes in one key. Therefore, if your voice be rightly pitched in the prelude, ſeek not to change it in the ſong.

The two firſt notes in the example are Fa, Mi: which interval, it is preſumed, you can tune at ſight. If otherwiſe, you muſt have recourſe to the general rule, and tune the intermediate note of that interval aſcending, thus, Fa, ſol, mi; immediately repeating the interval you want to found, thus, Fa, Mi.

The next note is the 2d, or Sol, which may be tuned from Mi, the laſt note, by deſcending; or from the key, as it hath an equal reference to both. We have laid before you this choice in conſideration of your firſt attempt. But when from experience you are become more perfect in tuning the intervals, the moſt approved way will be, to make the laſt note you ſung relative to the ſucceeding one, whoſe interval you are to tune. Whereby your ſinging an air will be no other than tuning the intervals as they ſucceed each other in the movement of the ſong; which you practiſed often before in the natural order, and with which you are ſuppoſed to be well acquainted.

The fourth note in the example being Sol, and a 4th to the laſt note you ſung, you will now tune a perfect 4th; not conſidering this note in relation to the key, to which it is a 5th; but in relation to the laſt founded note Sol, to which it is a 4th.

This is the method you will purſue in every interval after ſome improvement gained by practice. Notwithſtanding, it will be convenient ſometimes to have recourſe to the key, by ſounding it, and taking the interval from the ſame; whereby you will ſing better in tune by keeping to the pitch or key you began in; particularly if the interval from the laſt note be a great one, or diſcord, or lie near the key, above or below.

To ſum up all; every new note introduced, or not belonging to the harmony of the key, bearing the proportion of ſome concord or diſcord, to the preceding note or to the key, will come within the rules laid down, and therefore needs no repetition.

On the principles of the theory and practice of muſick, we ſhall now demonſtrate the art of tranſpoſing with the voice, or ſinging in any cliff at ſight, wherewith it may happen a perſon is not acquainted; and this from the knowledge of ſinging in any other cliff.

THEO-

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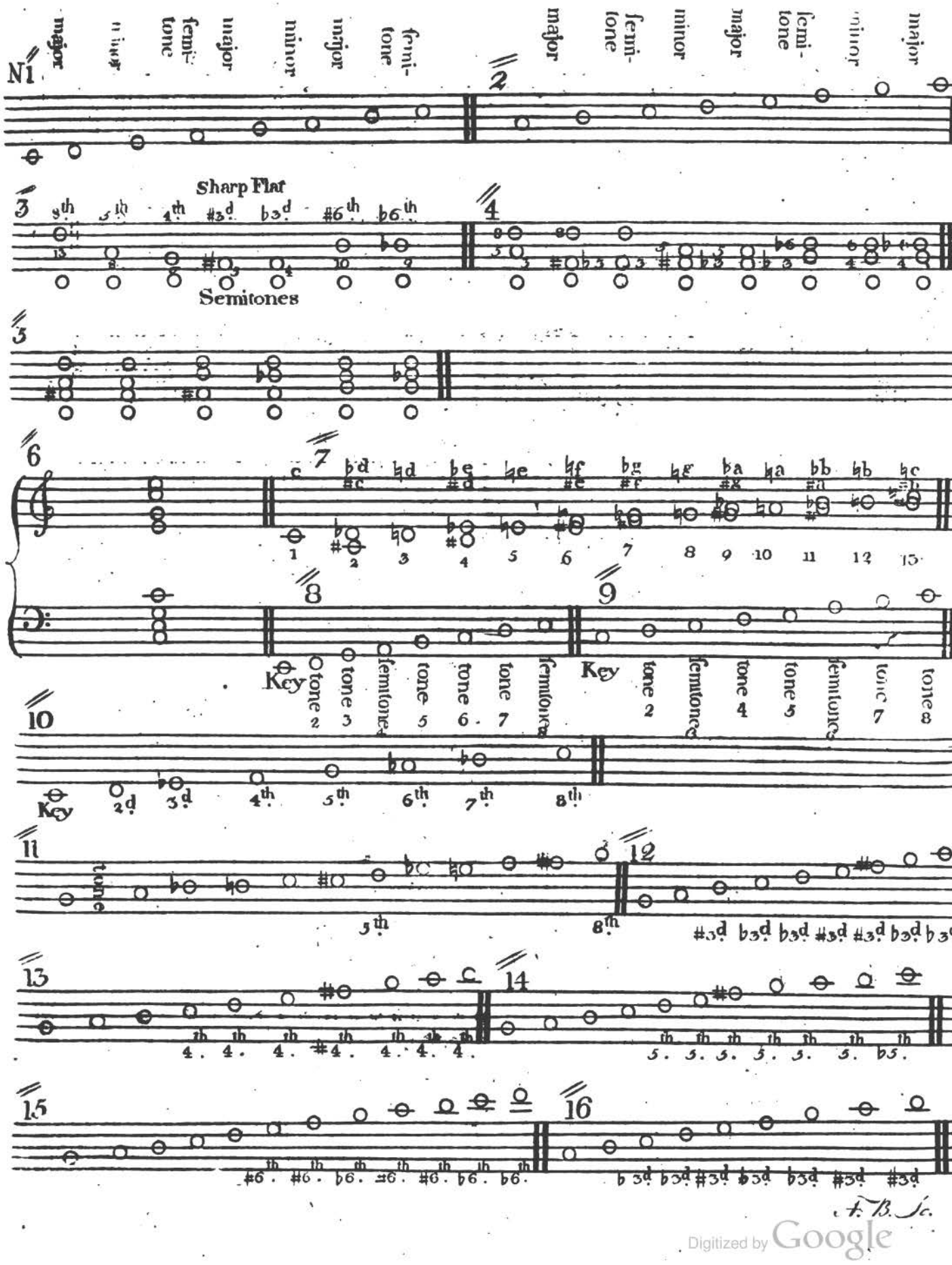

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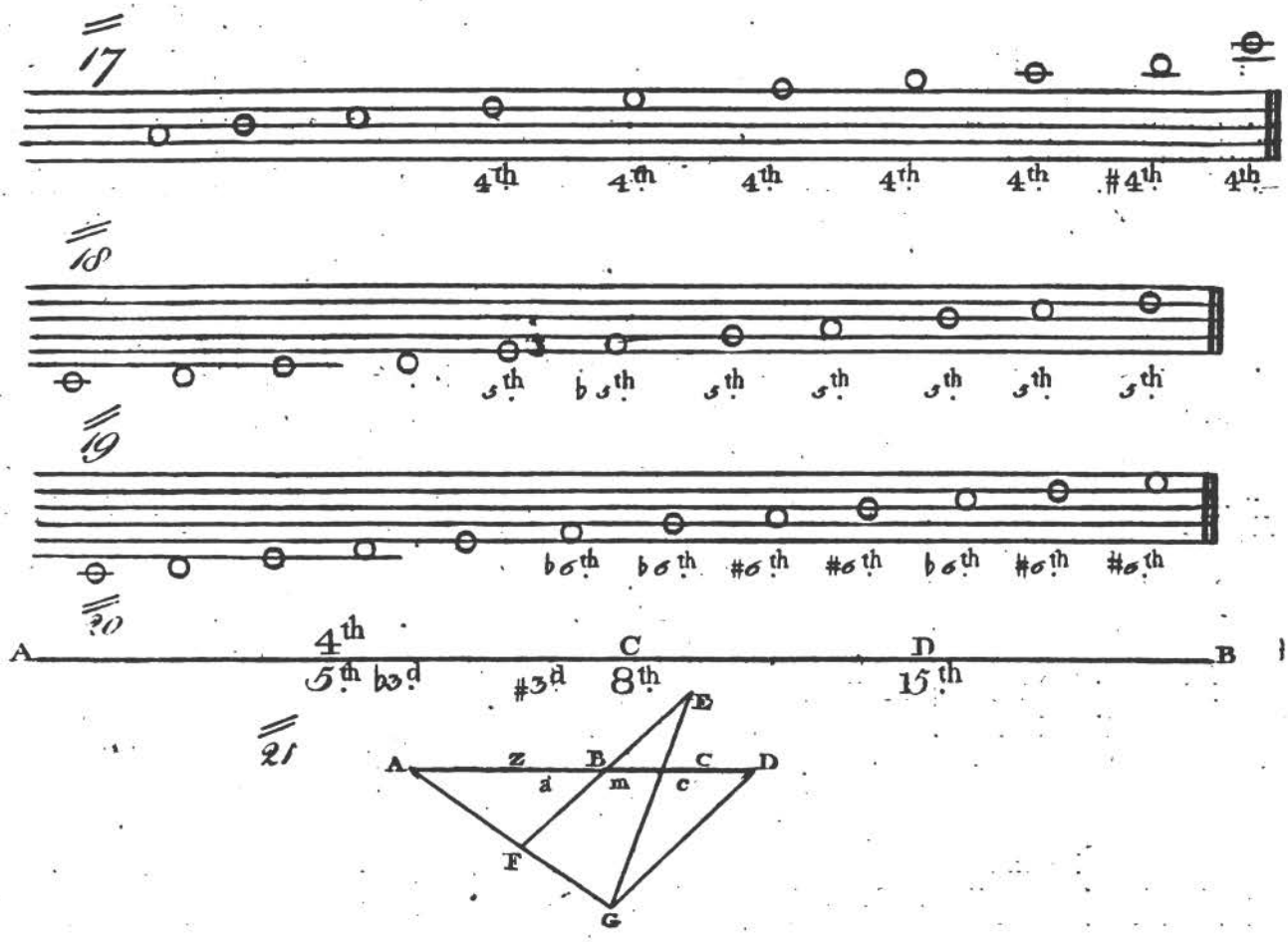

A Seimbrieve o whose Time is as long as 1, 2, 3, 4, or 2 Minums

4 Crotchets

8 Quavers

16 Semiquavers

32 Demise-miquavers

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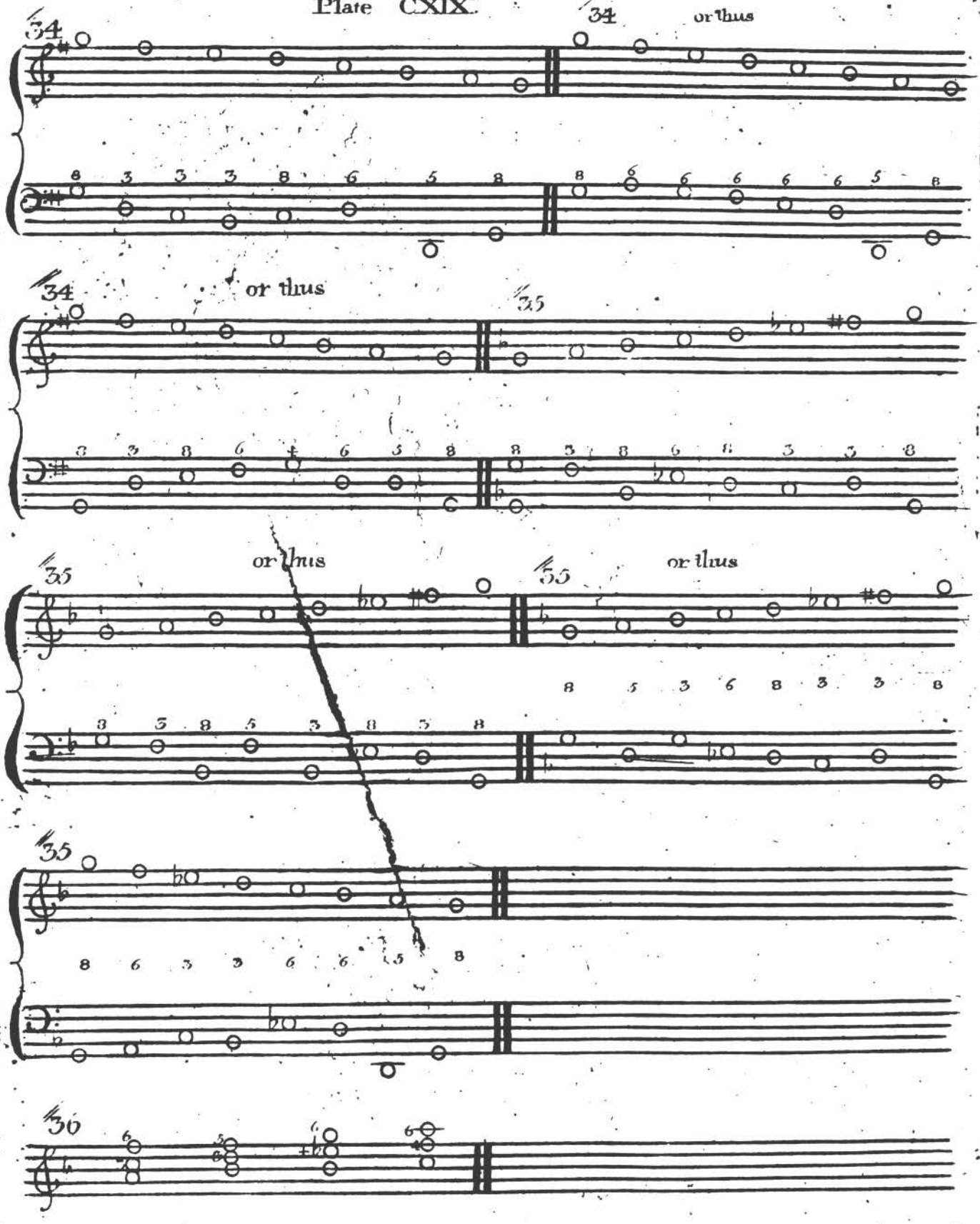
Plate CXIX.



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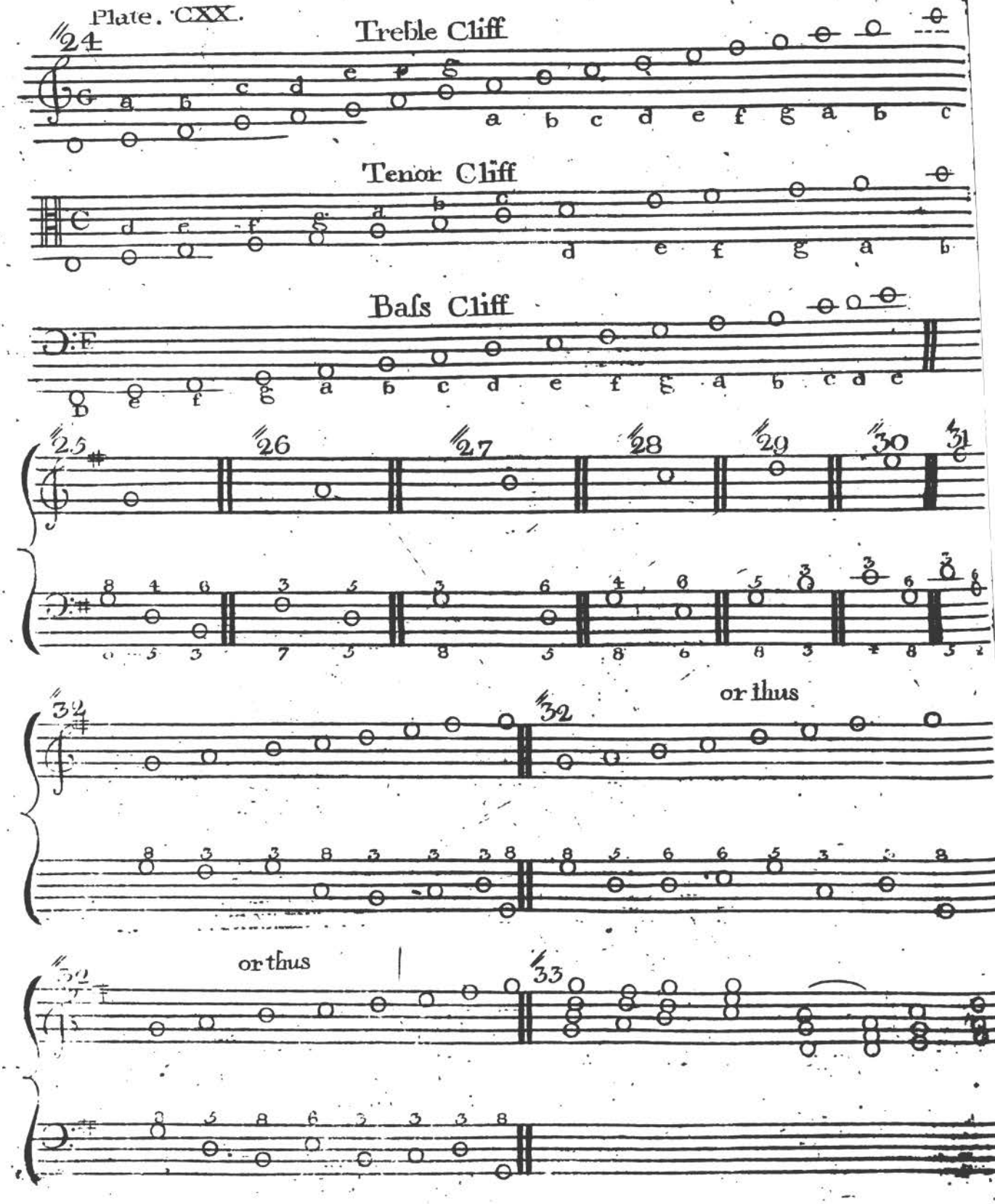

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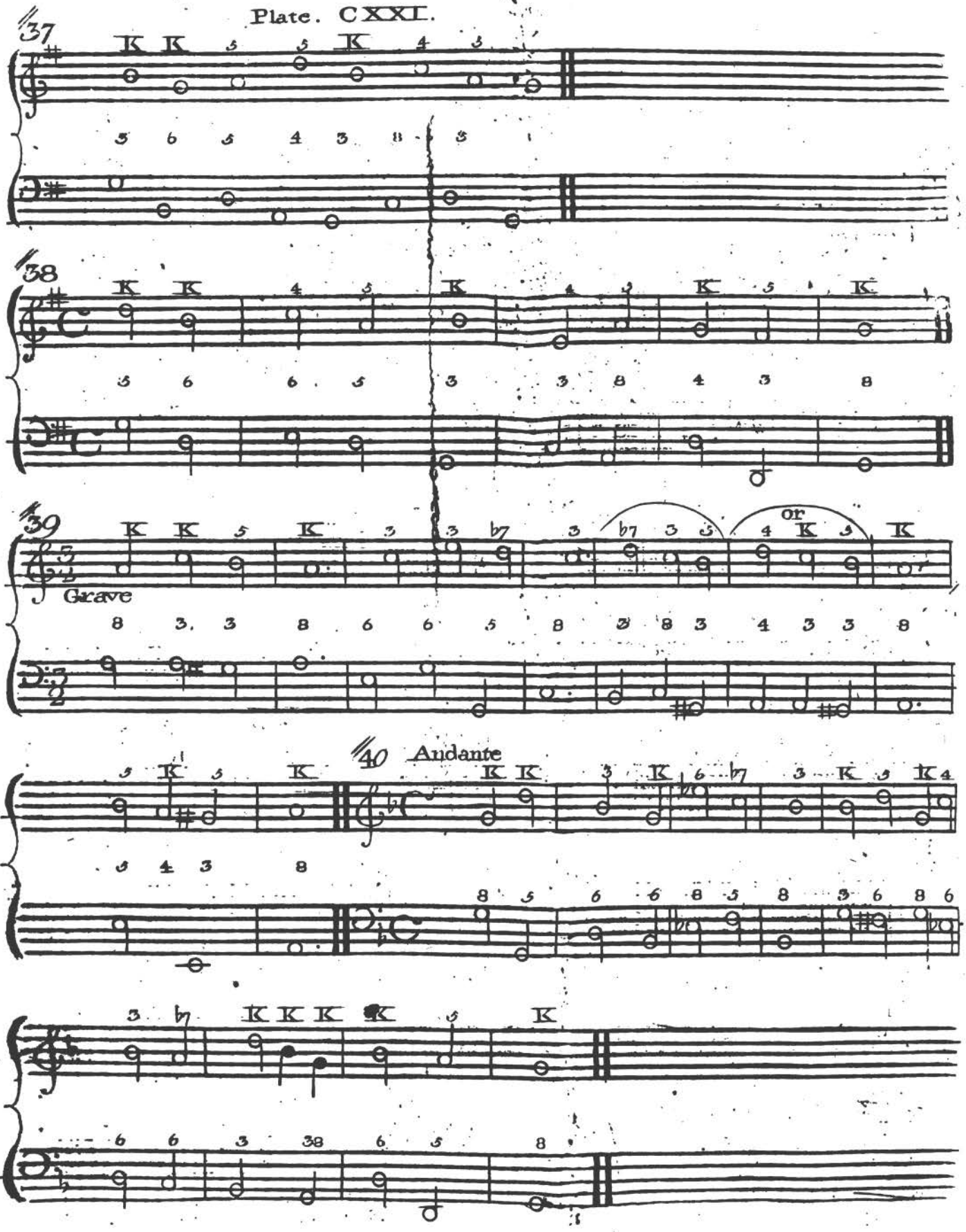

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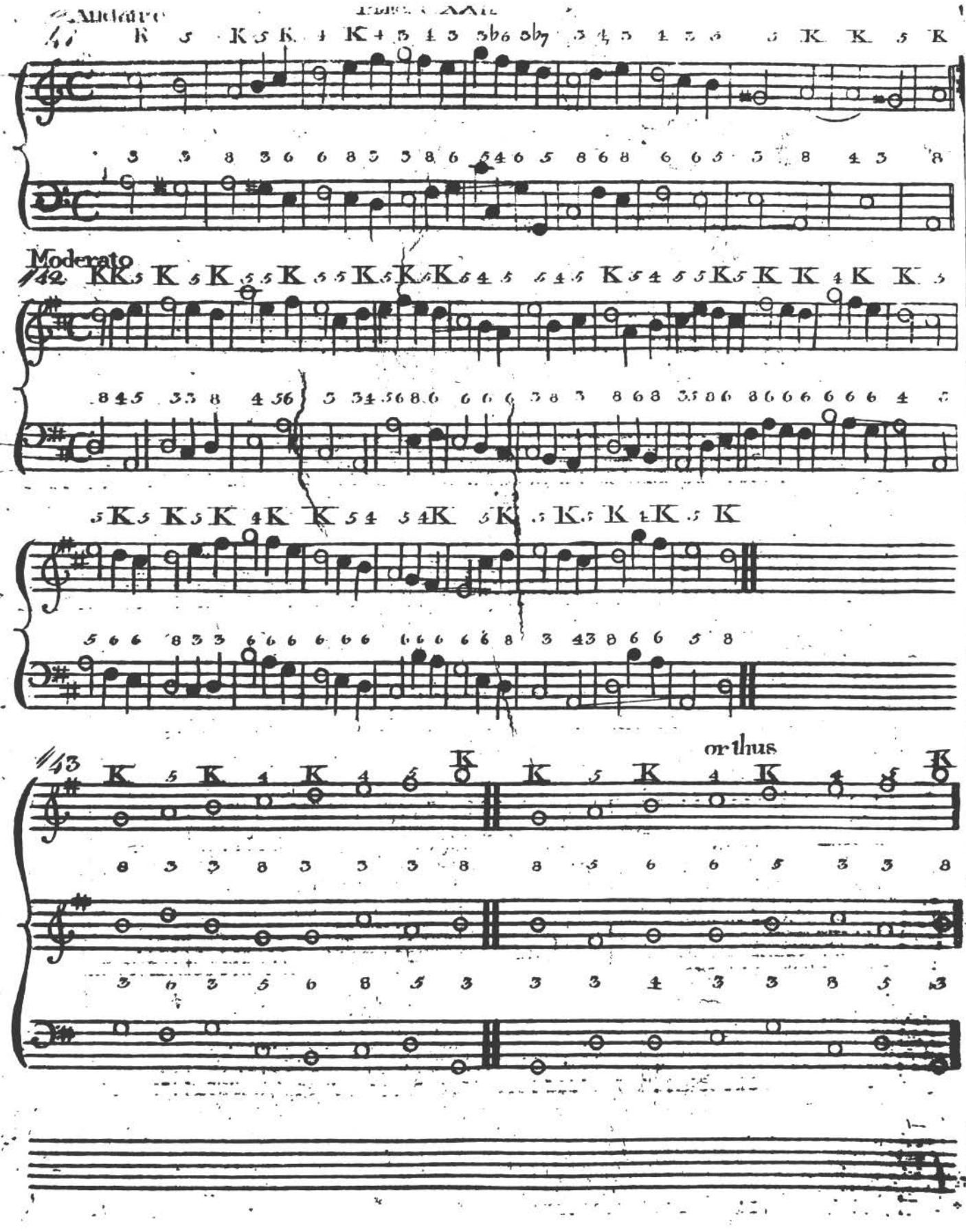

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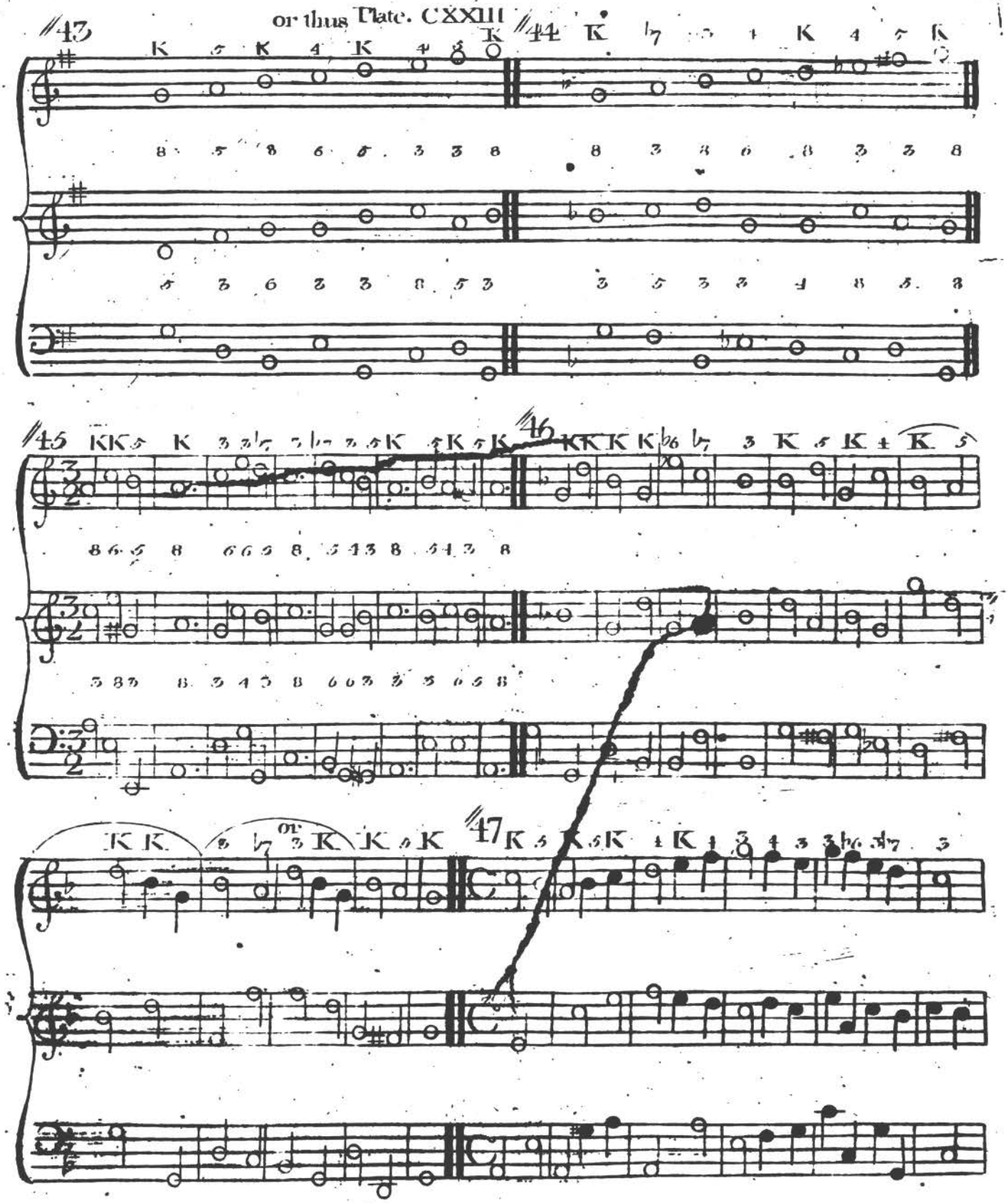

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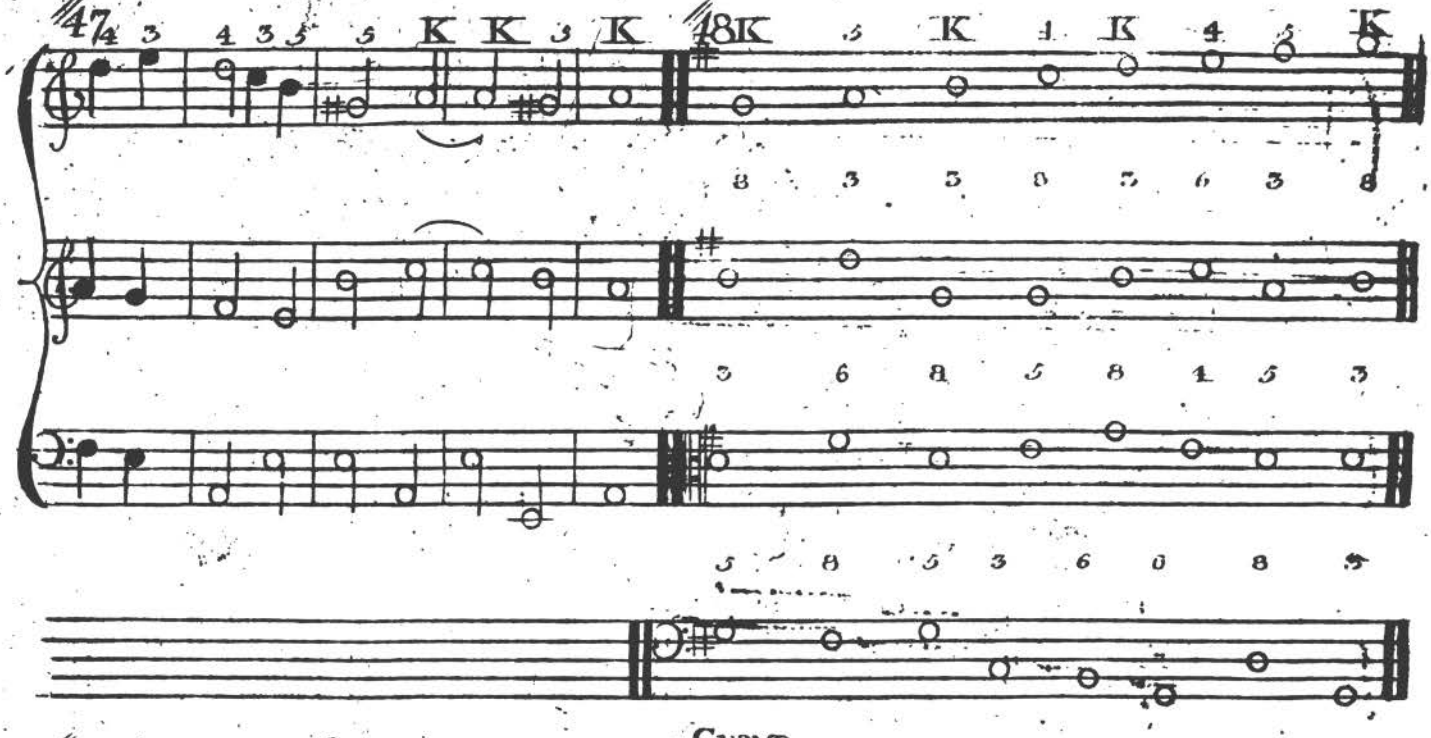

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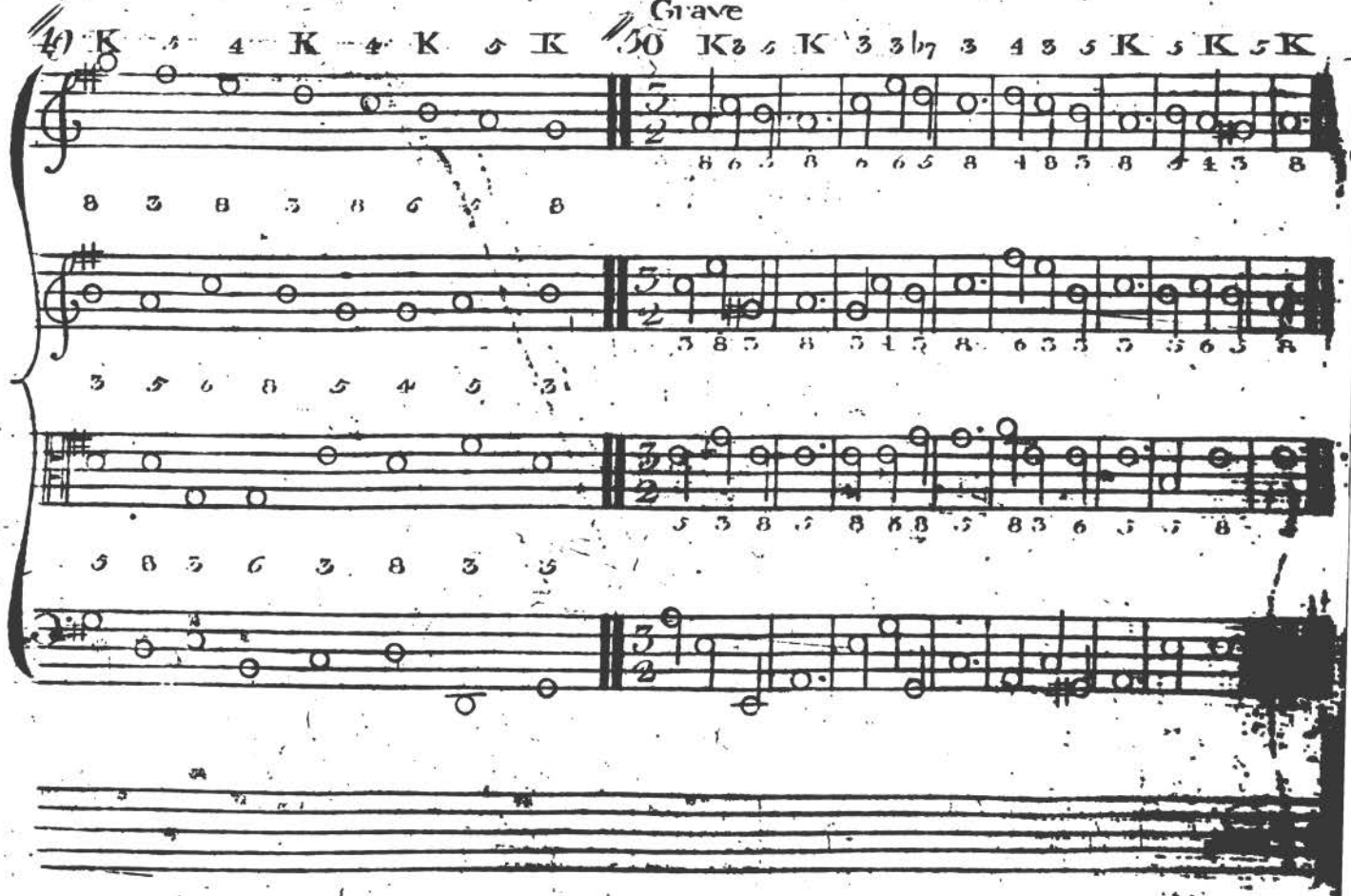

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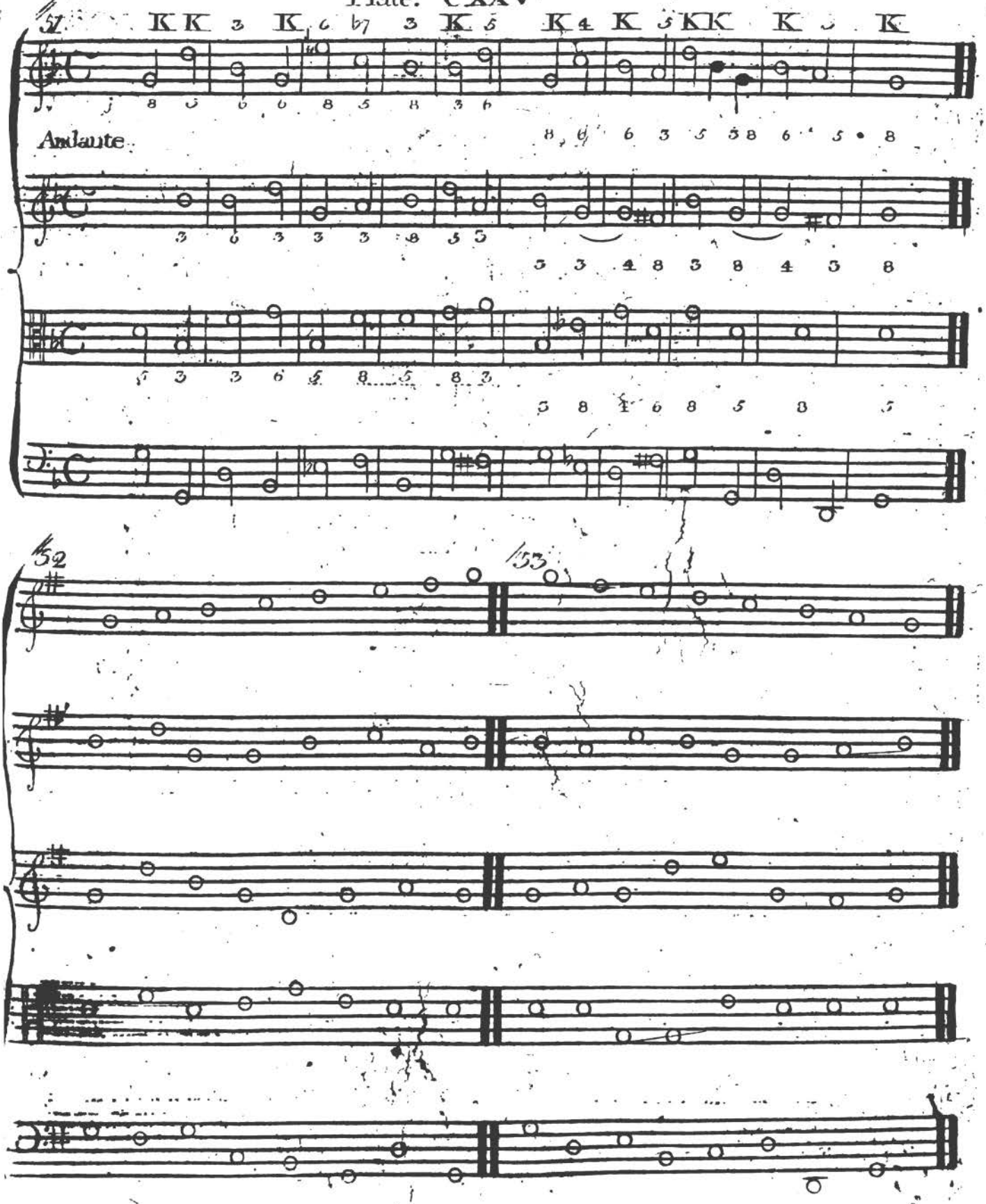
Plate. CXXV



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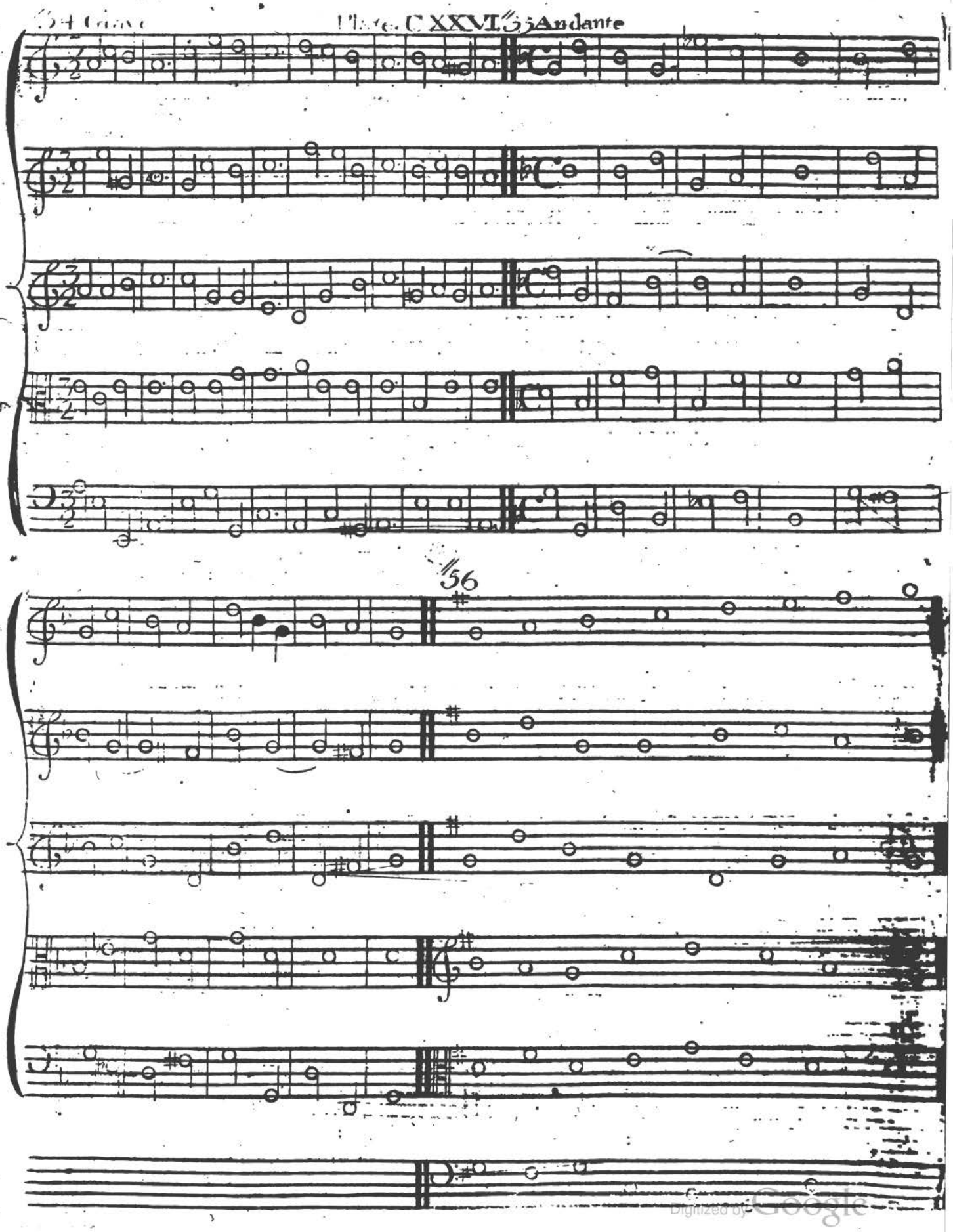

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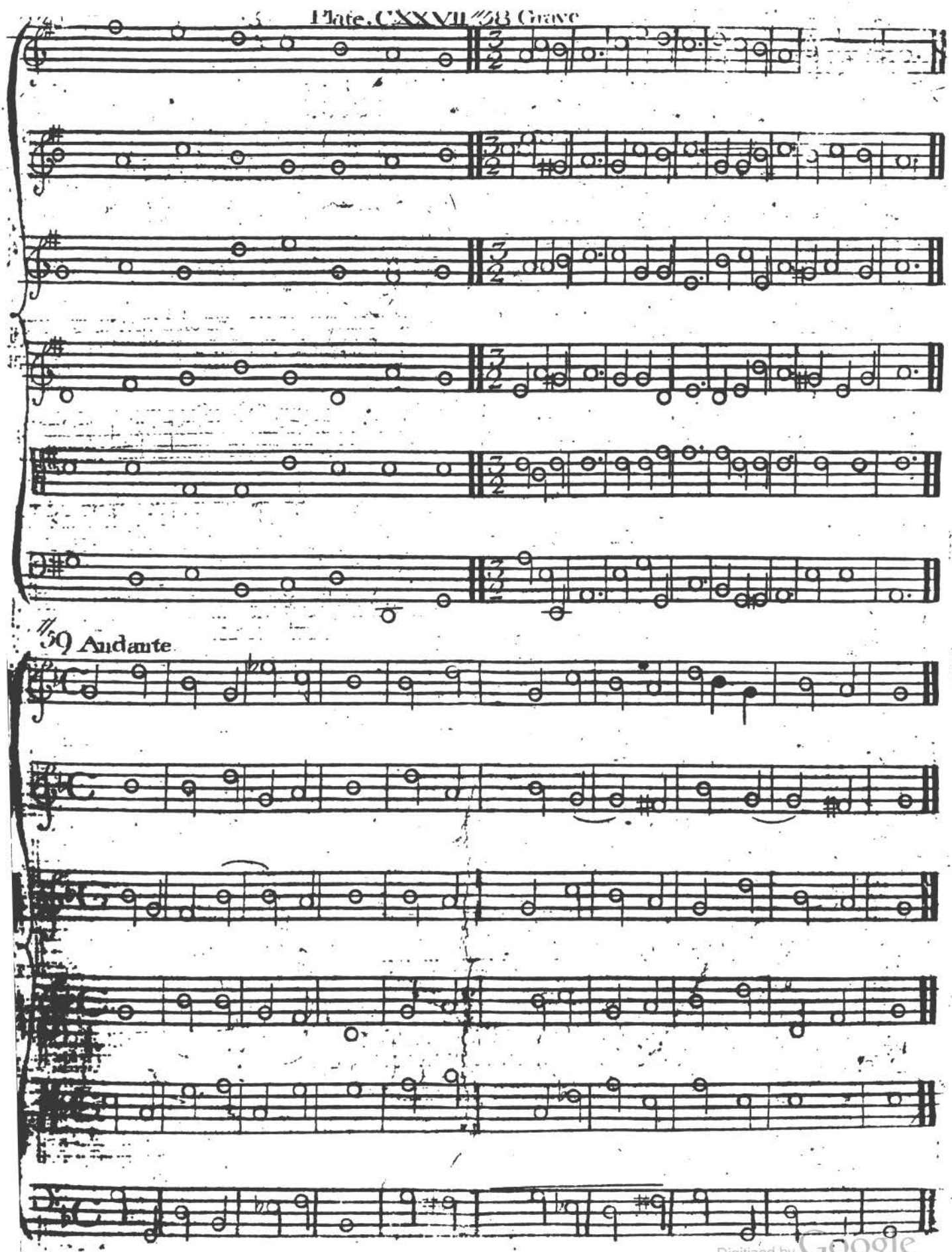

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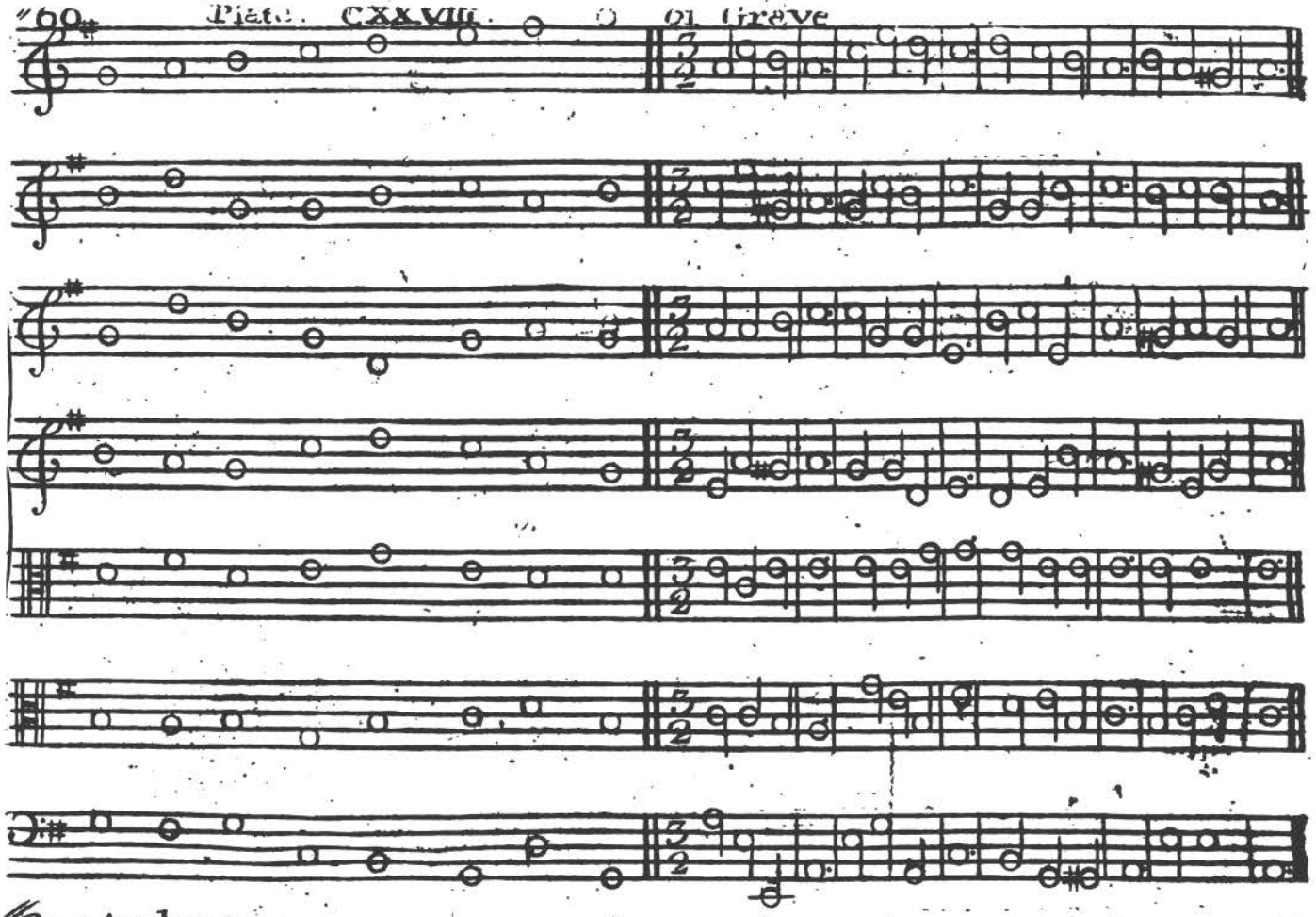
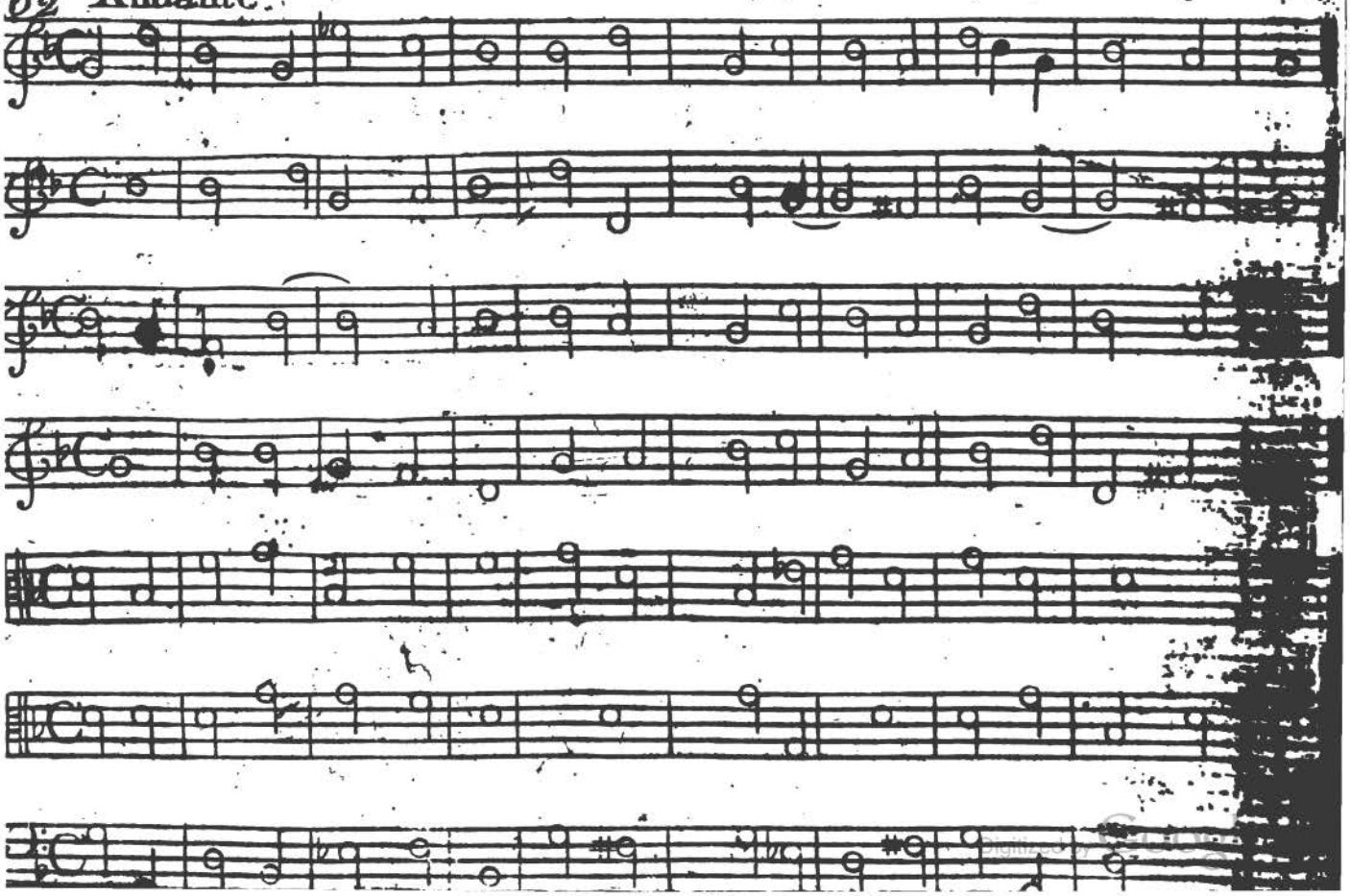
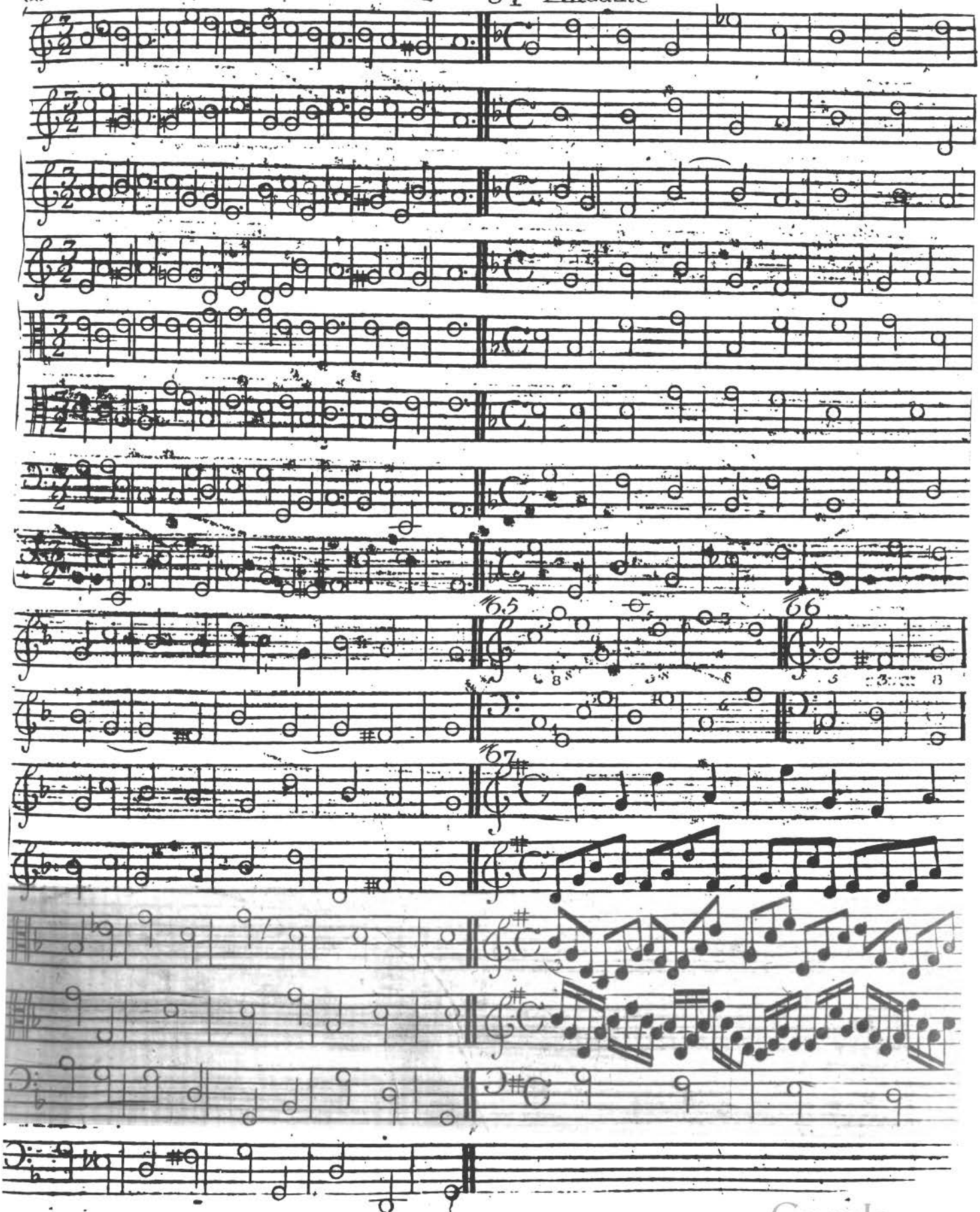


62 Andante.



63 Grave Plate. CXXIX 64 Andante



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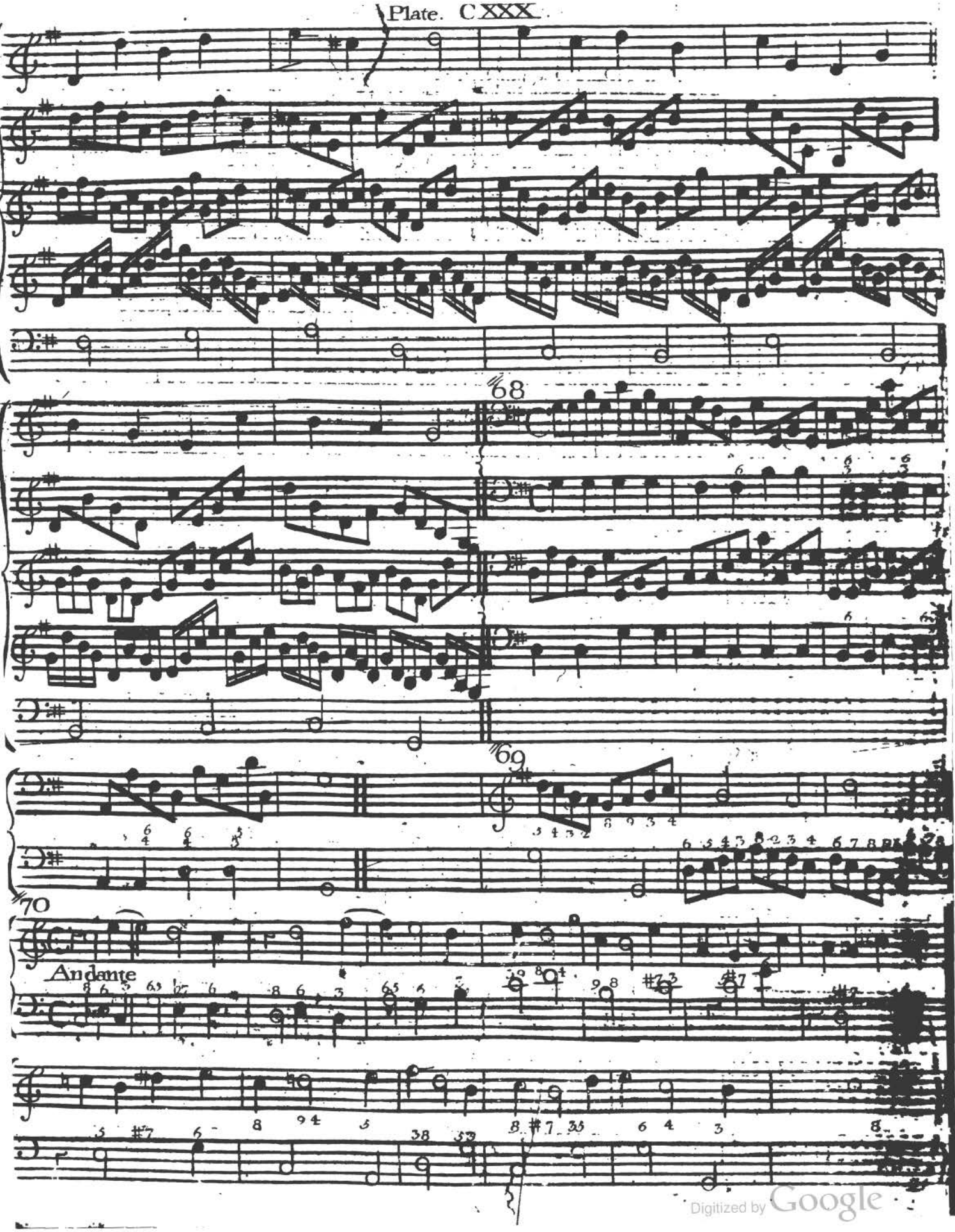

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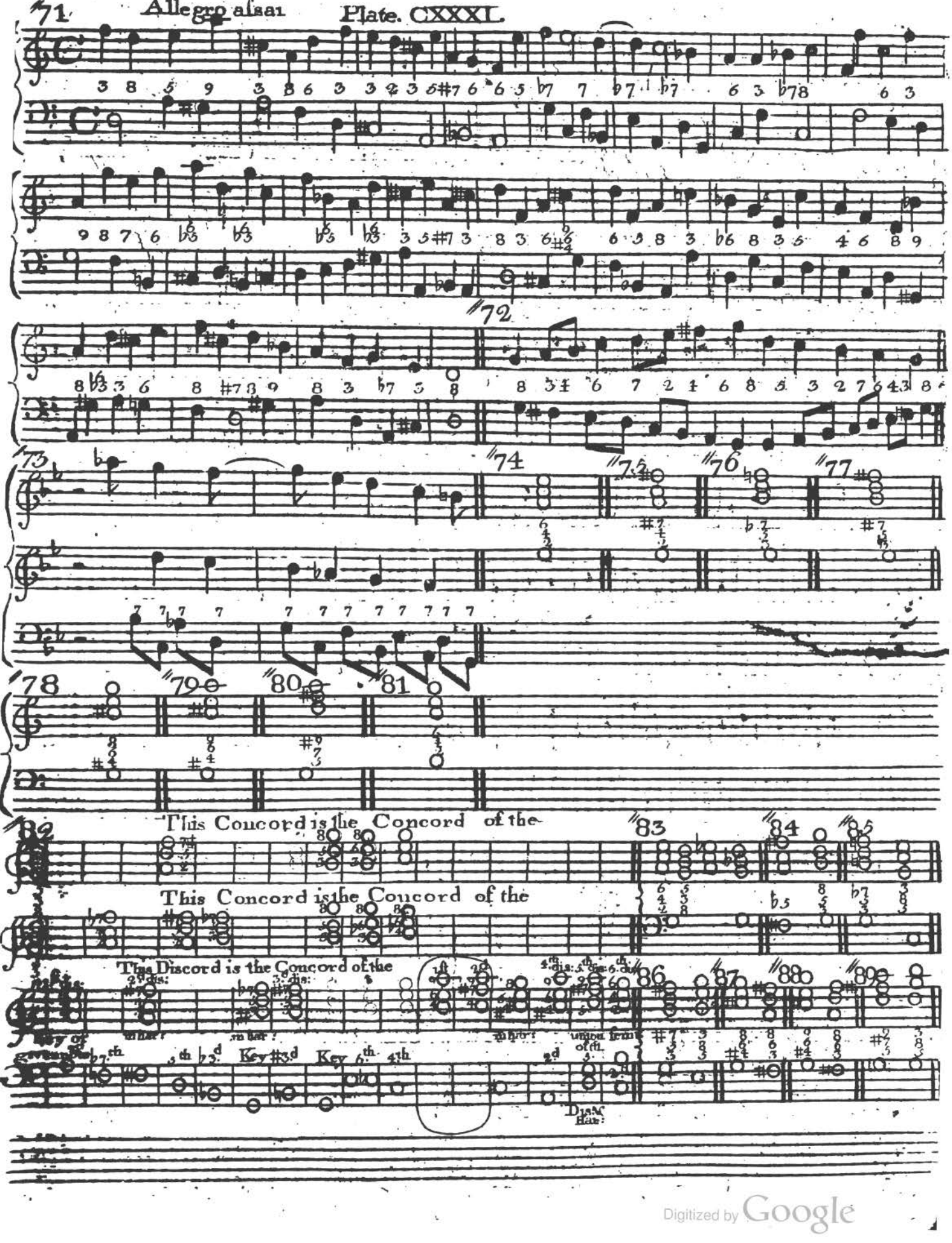
Allegro assai
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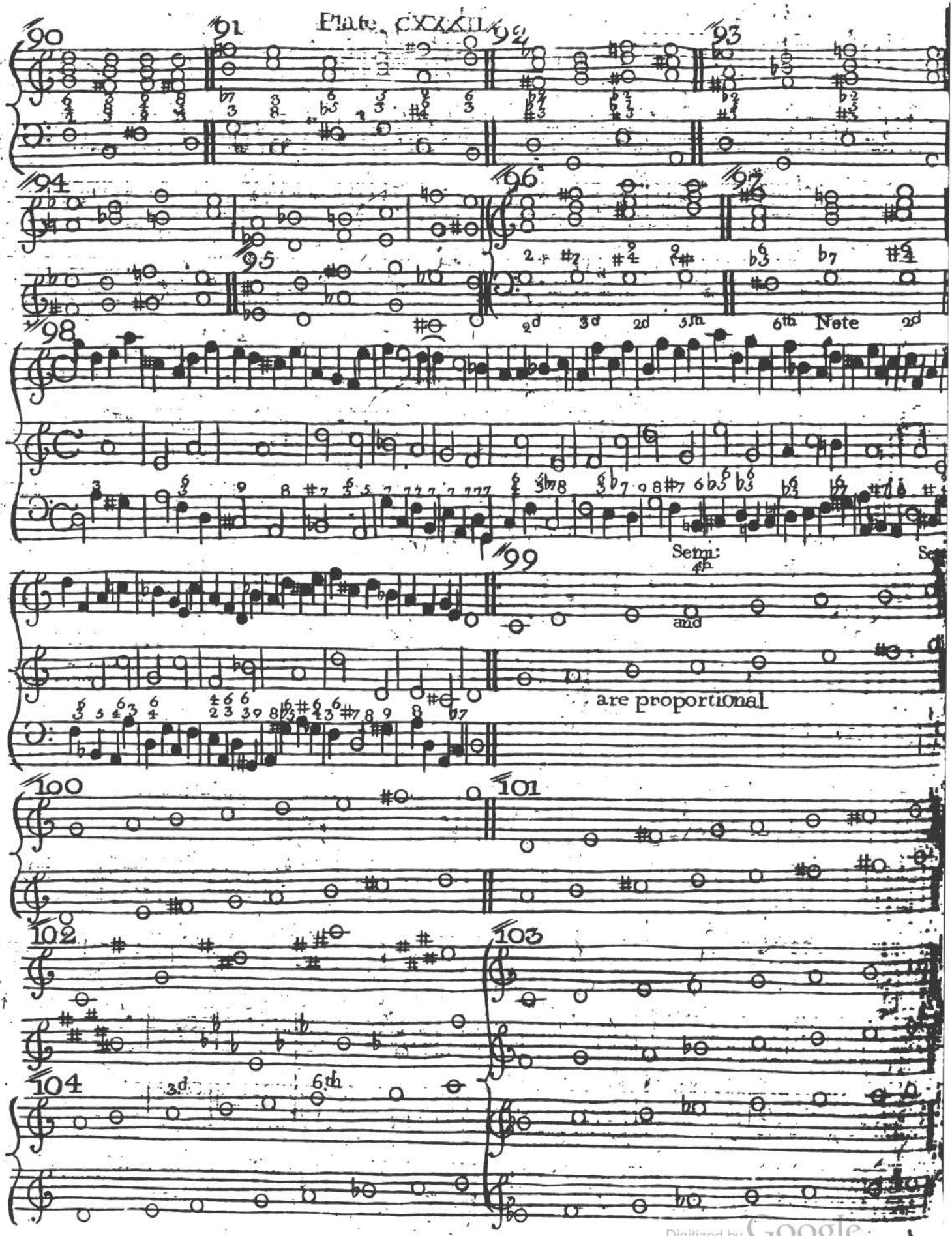

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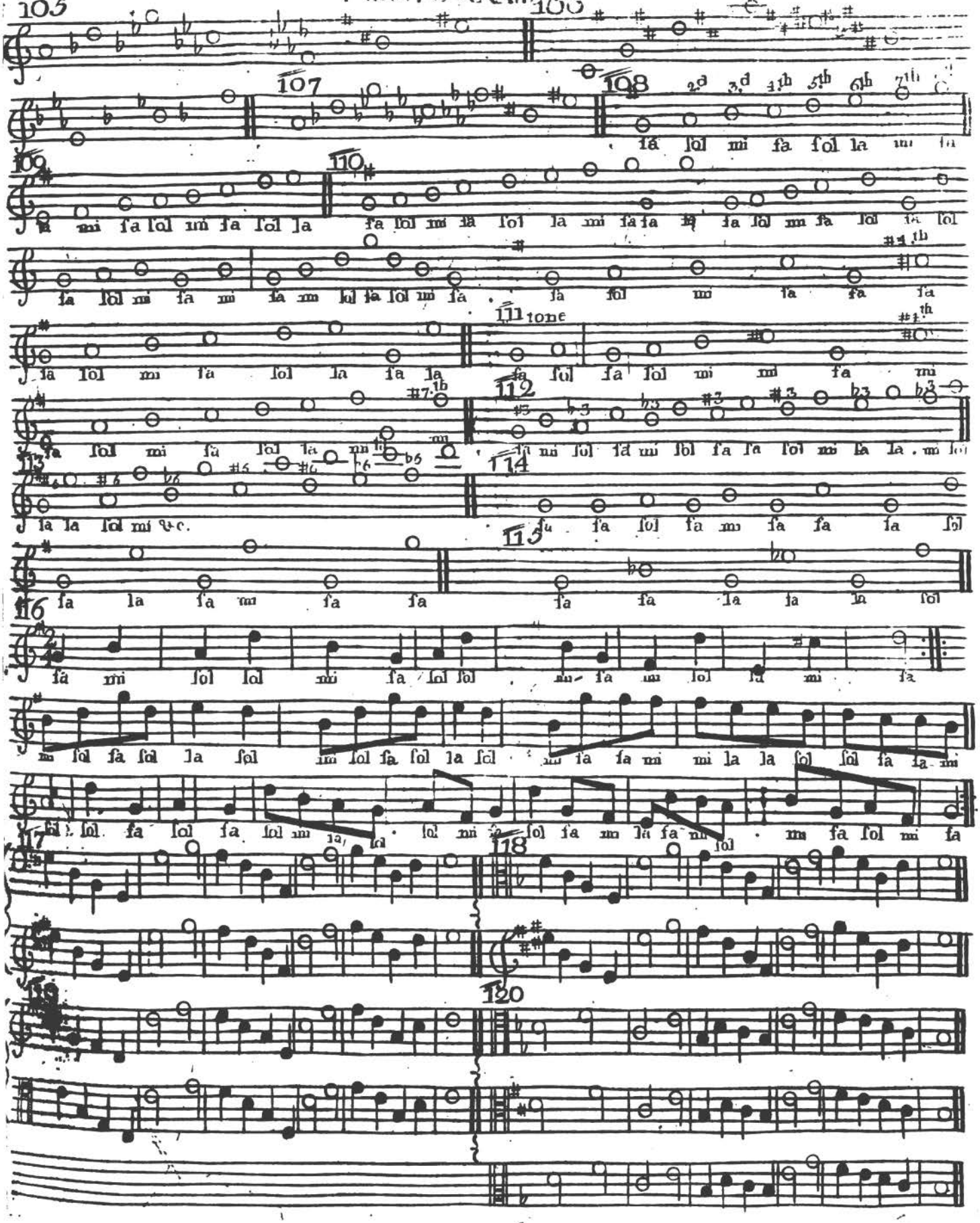

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THEOREM. The intervals of the notes of all ſharp keys and flat keys reſpectively, are proportional. Therefore, the ſinging at ſight in an unknown cliff will be by tranſpoſing out of the given cliff, into that you are acquainted with.

This is done by naming the key in the cliff you are to tranſpoſe into, and diſtinguiſhing whether the ſong hath a flat or ſharp 3d, compared to the examples of the nine ſharp and ſeven flat keys in uſe, knowing the name of each cliff. Now, the name of the baſs cliff is F, of the tenor C, and of the treble G.

Let it be required to ſing the notes in the following example in the baſs cliff unknown; tranſpoſed into the treble with which you are acquainted. No. 117.

The notes in the uppermoſt line, in the baſs cliff, are in G.

In the ſecond line and treble cliff, they are in E.

DEMONSTRATION. By the rules of tranſpoſition they are the ſecond and fifth inſtances in the ſharp key; then they are proportional: if proportional, the ſemitones are preſerved in their proper places: but keeping or ſinging the ſemitones in their places, is tuning the notes of the octave right; therefore this tranſpoſition from the baſs cliff into the treble is ſinging by note right.

The ſame example in the tenor. No. 118.

The notes of the tenor are in F; thoſe of the treble in E. But they are the ninth and fifth inſtances of ſharp keys, therefore proportional; and if proportional, *&c.*

Again, let the treble be the unknown cliff. No. 119.

The notes of the treble are in D, of the tenor in C. they are the third and firſt inſtances of ſharp keys; therefore proportional, *&c.*

This demonſtration from proportion extends to all poſſible caſes, and therefore makes the propoſition univerſal.

The laſt example ſhall be in the tenor cliff, ſet in the uſual places, and in a flat key. No. 120.

In the upper ſtave the key is G.

In the ſecond, B.

In the third, D. But theſe keys are the third, the ſixth and ſecond inſtances of the ſeven flat keys; hence they are proportional: therefore ſinging them in this proportion is preſerving the ſemitones; and therefore ſinging them right.

On theſe principles, it is apprehended, the art of ſinging by note is rendered intelligible, and the performance tolerably eaſy; and this eſpecially by removing the difficulties which have taken their riſe from the manner of delivering the precepts, and from the uſage of variety of cliffs: difficulties, which are the effects, we may ſay, of too much art, and for this reaſon perhaps the more perplexing; for whatever of this kind may ariſe from the nature of the ſubject of any ſcience, the ſame may by attention and ſtudy in time be ſurmounted, ſuch caſes lying open to every one's inquiry; it being the buſineſs of every ſearcher into nature to contemplate the things themſelves, and to make the beſt uſe of ſuch diſcoveries as offer themſelves towards the further improvement of ſcience.

MUS

MUSK, a dry, light, and friable ſubſtance, of a dark blackiſh colour, tinged with purple; it is a kind of perfume of a very ſtrong ſcent, and only agreeable when in a very ſmall quantity, or moderated by the mixture of ſome other perfume. It is found in a kind of bag or tumour which grows under the belly of the moſchus moſchiferus. See MOSCHUS.

Muſk is brought to us ſewed up in a kind of bladders or caſes of ſkin of the bigneſs of a pigeon's egg, or larger, each containing from two or three drams to an ounce of muſk. Theſe are covered with a browniſh hair, and are the real capſules in which the muſk is lodged while on the animal. That which is unadulterated appears in maſſes, of looſe and friable granules, which are ſoft to the touch, and eaſily crumble between the fingers, feeling ſomewhat ſmooth and unctuous.

Muſk taken inwardly produces eaſe from pain, quiet ſleep, and a copious diaphoreſis: hence it has been found of great uſe in ſpaſmodic diſorders, petechial, malignant, putrid fevers, the jail diſtemper, hiccoughs, *&c.* and Dr Wall obſerves, that it has been found uſeful in ſpaſmodic diſorders, given by way of clyſter. The operation of muſk in ſome reſpects reſembles that of opium; but it does not leave behind it any ſtupor or languidneſs, which the latter often does. Muſk likewiſe ſeems likely to anſwer in thoſe low caſes where ſleep is much wanted, and opiates are improper. It is ſaid to be beſt given in a bolus, in which form thoſe who are moſt averſe to perfumes may take it without inconvenience. Fifteen grains or more are now given in a doſe with great ſucceſs.

MUSKET, a fire-arm born on the ſhoulder, and uſed in war. The length of a muſket is fixed at three feet eight inches from the muzzle to the pan, and it carries a ball of ſixteen to the pound.

MUSKETOON, a kind of ſhort thick muſket, whoſe bore is the thirty-eighth part of its length: it carries five ounces of iron, or ſeven and a half of lead, with an equal quantity of powder. This is the ſhorteſt ſort of blunderbuſſes.

MUSLIN, a fine ſort of cotton cloth, which bears a downy knap on its ſurface. There are ſeveral ſorts of muſlins brought from the Eaſt-Indies, and more particularly from Bengal; ſuch as doreas, betelles, mulmuls, tanjeebs, *&c.*

MUSSÆNDA, in botany, a genus of the pentandria monogynia claſs. The corolla is funnel-ſhaped; it has two thickiſh ſtigmata; the berry is oblong, and the ſeeds are diſpoſed into four ſeries. There is but one ſpecies, a native of India.

MUSSELBOROUGH, a port-town of Scotland, in the ſhire of Lothian, ſix miles eaſt of Edinburgh.

MUSTARD, in botany. See SINAPI.

MUS-

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MUSTELLA, in zoology, a genus of quadrupeds of the order of feræ. There are ſix erect, ſharp, diſtinct teeth in the upper jaw, and an equal number in the under jaw, but blunter and cloſer together, and two of them are ſituated a little farther within the mouth; and the tongue is ſmooth. There are 11 ſpecies, *viz.* 1. The lutris, with the hind-feet palmated, and the tail about one fourth of the length of the body. It is found in Aſia and North America. 2. The lutra, or otter, has palmated feet, and a tail about one half of the length of the body. This animal is exceedingly voracious; but is fonder of fiſh than of fleſh. He ſeldom quits the banks of rivers, and can remain a conſiderable time below water. The female comes in ſeaſon in the winter, and brings forth three or four young in March. This animal is found in moſt countries of Europe and North America. 3. The lutreola has hairy palmated feet, and a white mouth. It is a native of Finland, and feeds upon frogs and fiſhes. 4. The barbata, is of a reddiſh colour; and the toes are not connected with a membrane. It is a native of Brazil. 5. The gulo is of a duſky red colour, and blackiſh on the middle of the back. It is found on the woody mountains of Lapland, Ruſſia, and Siberia. The gulo is a very voraceous animal, and devours hairs, birds, *&c.* He has an abominable odor; but his fur is very precious. 6. The martes, or marten, is of a blackiſh yellow colour, with a pale throat, and the toes are not webbed. This animal is a native of the ſouthern parts of Europe; it frequents the woods, and feeds upon ſquirrels, mice, and birds. 7. The putorius, or pole-cat, has unconnected toes, is of a dirty yellow colour, with a white mouth and ears. This animal is very deſtructive to birds and poultry. He conceals himſelf during the day; but ſteals into barns, dove-cotes, hen-houſes, *&c.* in the night, in order to catch his prey. He is a native of moſt parts of Europe. 8. The furo, or ferret, has red eyes, and unconnected toes. This animal is eaſily tamed, and frequently employed to hunt rabbits out of their holes. The female is leſs than the male, and brings forth twice in the year, 5 or 6 at a litter. It is a native of Africa. 9. The zibellina has divided toes; the body is of a duſky yellow colour, with a white forehead, and an aſh-coloured throat. It is found in Tartary, and the northern parts of Aſia. 10. The erminea has divided toes; and the point of the tail is red. The ſkin of this animal is a valuable fur, and of a fine white colour. It is a native both of Europe and Aſia, and particularly of the northern climates. It feeds upon mice, eggs, *&c.* and has a very offenſive ſmell. 12. The nivalis has divided toes, and a white body. It is very ſimilar to the ermine, but about one half leſs in ſize. It is found in Ruſſia and the northern parts of Europe. See Plate CV. fig. 3. and Plate CVI. fig. 1, 2, 3, 4.

MUTE, in a general ſenſe, ſignifies a perſon that cannot ſpeak, or has not the uſe of ſpeech.

MUTE, in grammar, a letter which yields no ſound without the addition of a vowel. The ſimple conſonants are ordinarily diſtinguiſhed into mutes and liquids or ſemi-vowels.

MUTILATION, the retrenching or cutting away any member of the body.

MUTILATION, in Scots law. See LAW, Tit. xxxiii.

MUTULE, in architecture, a kind of ſquare modillion ſet under the corniche of the Doric order.

MUTUUM, or LOAN, in Scots Law. See LAW. Tit. xx. 7.

MUZZLE *of a gun or mortar*, the extremity at which the powder and ball is put in; and hence, the muzzle-ring is the metalline circle, or moulding, that ſurrounds the mouth of the piece.

MYAGRUM, in botany, a genus of the tetrandria ſiliculoſa claſs. The pod is terminated with a conical ſtylus, and generally contains but one ſeed. There are nine ſpecies, only one of which, *viz.* the ſativum, or gold of pleaſure, is a native of Britain.

MYCONE, one of the iſlands of the Archipelago, about twenty-five miles in circumference, ſituated in E long. 25°. 6′, N. lat. 37°.

MYLOGLOSSUM, in anatomy. See ANATOMY, p. 304.

MYLOHYOIDÆUS, in anatomy. See ANATOMY. p. 304

MYOLOGY, that part of anatomy which treats of the muſcles of the human body. See ANATOMY, Part II.

MYOPIA, ſhort-ſightedneſs, a ſpecies of viſion, wherein objects are ſeen diſtinctly only at ſmall diſtances. See OPTICS.

MYOSOTIS, in botany, a genus of the pentandria monogynia claſs. The corollary conſiſts of 5 emarginated ſegments. There are four ſpecies, only one of which, *viz.* the ſcorpioides, or mouſe-ear ſcorpion-graſs, is a native of Britain.

MYOSURUS, in botany, a genus of the pentandria polygynia claſs. The calix conſiſts of five leaves connected at the baſe; it has five ſubulated, petal-ſhaped nectaria; and the ſeeds are numerous. There is but one ſpecies, *viz.* the minimus, or mouſe-tail, a native of Britain.

MYRIAD, a term ſometimes uſed to denote ten thouſand.

MYRICA, in botany, a genus of the dicœcia tetrandria claſs. The amentum of the male has a lunulated ſcale; the corolla is wanting both in the male and female; the female has two ſtyli; and the berry contains only one ſeed. There are five ſpecies, none of them natives of Britain.

MYRIOPHYLLUM, in botany, a genus of the monœcia polyandria claſs. The calix of both male and female conſiſts of four leaves, and none of them have any corolla: the male has eight ſtamina, and the female four piſtilla; and there are four naked ſeeds. There are two ſpecies, both natives of Britain, *viz.* the ſpicatum, or ſpiked water-millfoil; and the verticillatum, or verticillated mill-foil.

MYRMECOPHAGA, in zoology, a genus of quadrupeds belonging to the order of bruta; the characters of which are theſe: There are no teeth in the mouth; the tongue is long and cylindrical; the head terminates in a long ſnout or muzzle; and the body is covered with

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with pretty long hair. There are 4 ſpecies, *viz.* 1. The didactyla, or white American coati of Seba, has two toes on the fore-feet and four on the hind-feet. This animal is about 7 inches long; the head is two inches in length; the ſnout is not ſo long as that of the other ſpecies; the tail is about an inch longer than the body, and covered with pretty long hair; the legs are not made for walking, but jumping. He climbs trees, and hangs on the branches by the extremity of his tail. In this ſituation he thruſts his long tongue in the holes or fiſſures of trees, and brings it out covered with ants or other inſects. He can live long without nouriſhment of any kind, ſleeps generally in the day, and ſearches for food in the night. 2. The tridactyla, tamandua-guaca, or tamanoir, has three toes on the fore-feet, and five on the hind-feet, and long hair on the tail. This animal is about four feet long, and the head and ſnout about fifteen inches: It is a native of the Eaſt Indies, and feeds upon ants, *&c.* in the ſame manner as the didactyla. See Plate CXVI. fig. 4.—3. The jubata, has four toes on the forefeet and five on the hind ones, and a very hairy tail. This animal reſembles the tridactyla, and is found at the Cape of Good Hope. 4. The tetradactyla, has four toes on the fore-feet and five on the hind, with a tail naked at the extremity. It is a native of ſouth America.

MYROBALANS, a kind of medicinal fruit brought from the Indies, of which there are five kinds: 1. The citrine, of a yelloviſh-red, hard, oblong, and the ſize of an olive: 2 The black, or Indian myrobalan, of the bigneſs of an acorn, wrinkled, and without a ſtone: 3. Chebulic myrobalans, which are of the ſize of a date, pointed at the end, and of a yelloviſh-brown. 4 Emblic, which are round, rough, the ſize of a gall, and a dark-brown: and, 5. Belleric, which are hard, round, of the ſize of an ordinary prune, leſs angular than the reſt, and yellow. Each of theſe kinds are ſlightly purgative and aſtringent; but Quincy obſerves, that the beſt of them are not worth regarding, ſince they rather clog than aſſiſt any compoſition.

MYRRH, a vegetable production of the gum or reſin kind, iſſuing by inciſion, and ſometimes ſpontaneouſly, from the trunk and larger branches of a tree growing in Egypt, Arabia, and Abyſſinia. The inciſions are made twice a-year, and the myrrh ouzing out is received on ruſh-mats diſperſed underneath.

Myrrh is ſent over to us in looſe granules of various ſizes, from that of a pepper-corn, to the bigneſs of a walnut. The generality of them, however, are from the ſize of a pea, to a little more than that of a horſe-bean: theſe are ſometimes roundiſh, but often irregularly long and contorted. The colour of myrrh is a reddiſh-brown, with more or leſs of an admixture of yellow, and in the pureſt pieces it is ſomewhat tranſparent. Its taſte is bitter and acrid, with a peculiar aromatic flavour, but very nauſeous: but its ſmell, though ſtrong, is not diſagreeable. It is to be choſen in clear pieces, light, friable, and of the bittereſt taſte. Myrrh is of great uſe in medicine; it powerfully reſolves and attenuates thick and viſcid blood, and concreted bile, and glutinous humours, and is good in obſtructions of the menſes, and in infarctions of the viſcera.

MYRSINE, in botany, a genus of the pentandria monogynia claſs. The corolla conſiſts of five ſegments; and the berry has five cells and five ſeeds. There is but one ſpecies, a native of Æthiopia.

MYRTIFORM, in anatomy, an appellation given to ſeveral parts, from their reſembling myrtle-berries.

MYRTLE, in botany. See MYRTUS.

MYRTUS, the MYRTLE, in botany, a genus of the icoſandria monogynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; and the berry contains two or three ſeeds. There are 13 ſpecies, none of them natives of Britain.

MYSIA, the ancient name of a province in Aſia, being the north-weſt part of Natolia or Aſia Minor.

MYTHOLOGY. The word *mythology* is a Greek compound, that ſignifies *a diſcourſe on fables*; and comprehends, in a collective ſenſe, all the fabulous and poetic hiſtory of pagan antiquity. It follows therefore, that this ſcience teaches the hiſtory of the gods, demi-gods, and fabulous heroes of antiquity; the theology of the pagans, the principles of their religion, their myſteries, metamorphoſes, oracles, *&c.* By this definition, it appears ſufficiently what are the objects of which we are to treat in this article.

If we well conſider the matter, we ſhall find, that there were, in pagan antiquity, three different religions. Firſt, That of the philoſophers, who treated metaphyſically of the nature, the attributes, and of the works of the Supreme Being. They endeavoured to diſcover the true God, and the manner in which he ought to be worſhipped. It is not wonderful, that theſe men of exalted genius ſhould in ſome degree ridicule, in their works, the two other poſitive religions, and thoſe gods on whom they were founded; at the ſame time that they outwardly profeſſed the eſtabliſhed religion, in order to preſerve the peace of ſociety, and to avoid the perſecutions of the legiſlature, and the inſults of the populace. For in fact, was it poſſible for them to believe the pagan fables? Muſt they not foreſee, that their religion would one day give place to another, while their own works would paſs with their names to the lateſt poſterity? And could they ſuffer the thought, that their reputation would be tarniſhed in the eyes of that poſterity, by having it imagined they believed ſuch idle tales as were broached by the prieſts of their times? Could Plato, Socrates, Seneca, and Cicero, be unconcerned for their fame among future generations, and future philoſophers? And what ſhould we at this day have ſaid of thoſe great men, had they been ſo political, or hypocritical, as to have entirely concealed their ſentiments with regard to theſe matters?

The ſecond religion was that of paganiſm, which was the eſtabliſhed religion of all the ancient nations except the Jews. This was the doctrine that was taught by the prieſts, and protected by the ſovereigns. Its dogmas were demonſtratively falſe, but not always ſo abſurd as may at firſt appear, eſpecially if we annex to the divinities, and to the religious ceremonies of the pagans, a ſenſe that is frequently myſtic, and always allegoric; if we remember, that

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that the firſt heathens deified thoſe great men to whom the reſt of mankind were indebted for any ſignal benefits, as Jupiter, Apollo, Ceres, Bacchus, Hercules, Æſculapius, *&c.* in order to induce others, as well of the preſent as future ages, to reverence and to imitate them. Would not an ancient pagan, if he were to return upon the earth, have ſpecious arguments, at leaſt, to ſupport his religion, when he ſaw weak mortals beatify or canonize, merely by their own authority, other weak mortals (frequently mere pedants,) and place them in heaven, without the permiſſion or approbation of the Supreme Being? Happy is it for mankind, when at different times ſagacious pontiffs purge the calendar, and the brains of the people, from a herd of pretended ſaints, and prevent them, at leaſt after their death, from doing injury to ſociety, by interrupting the induſtry of the laborious inhabitants with keeping their feſtivals.

The third religion was idolatry, or the religion of the populace. For the common people, born to be deceived in every thing, confounding in their imaginations the ſtatues of the gods, the idols of their divinities, the emblems of their virtues and of religious worſhip, with the gods, divinities, virtues and worſhip themſelves, adored theſe images, and proceeded to extravagancies the moſt ridiculous, and frequently moſt criminal, in their ceremonies, feaſts, libations, ſacrifices, *&c.* It is to be feared, that, as long as there are upon the earth men of our limited capacities, this triple religion will conſtantly ſubſiſt under different forms; and we are much deceived, if it may not be found under the empire of Chriſtianity itſelf, notwithſtanding the purity of its doctrine. It will be eaſily conceived, that it is not of the religion of philoſophers, nor that of the populace, of which we are to treat in this article of Mythology; but of that which ſubſiſted under the authority of the magiſtracy and the prieſthood, and conſequently of paganiſm in general.

As far as we are able to judge by all the ancient authors we have read, the pagans adored the ſovereign Lord of the univerſe under the name of *Fate* or *Deſtiny*, which we muſt not confound with *Fortune*, who was regarded as a ſubaltern divinity. Jupiter himſelf, all the gods, every animated being, the heavens, the earth, the whole frame of nature, was ſubſervient to Deſtiny, and nothing could reverſe its decrees. This divinity was ſo highly adorable, as to be above all rank; and was regarded as too ſupreme to be repreſented under any ſenſible image or ſtatue, or to have any temple erected for its worſhip. We do not remember to have read, that any ſacrifice was ever offered to this Deſtiny, or that any temple or city was ever dedicated to its name. We are almoſt inclined to think, that the pagans were ſenſible, that the temple and the worſhip of the God of gods ought to be in the heart of man. Mention is made, indeed, of a temple that was dedicated to the Unknown God, but we are ignorant whether or not Deſtiny were thereby meant. We muſt not confound this Deſtiny, moreover, with the goddeſs of chance, of which there are ſome antique ſtatues that repreſent her in a recumbent poſture, and playing with little bones; for this was nothing more than an invention of ſome ſtatuary.

After this general and philoſophical idea of the Supreme Being, comes the poſitive religion of the pagans. This was entirely founded on fable, which took its riſe either from ancient traditions, or hiſtorical events, altered or augmented by the imaginations of the poets, by ſuperſtition, or by the credulity of the people; or elſe it conſiſted of allegoric or moral fictions. A crowd of writers, and among the reſt *Noel le Comte*, (Natalis Comes,) the abbots Bannier and Pluche, *&c.* have made many reſearches into the origin of fable: and they think they have diſcovered its ſource, 1. in the vanity of mankind; 2. in the want of letters and characters; 3. in the deluſive eloquence of orators; 4. in the relations of travellers; 5. in the fictions of poets, painters, ſtatuaries, and dramatic writers; 6. in the diverſity and uniformity of names; 7. in the ignorance of true philoſophy; 8. in the foundation of colonies, and the invention of arts; 9. in the deſire of having gods for our anceſtors; 10. in the imperfect or falſe interpretation of the holy ſcriptures; 11. in the ignorance of ancient hiſtory; 12. in a like ignorance of chronology; 13. in that of foreign languages; 14. in the tranſlation of the religion of the Egyptians and Phœnicians into Greece; 15. in the ignorance of geography; and, 16. in the belief that the firſt people had of the intercourſe of gods with men. It is certain, that all theſe matters taken together are ſufficient to produce many thouſands of fables; are more than ſufficient to enable us to deceive ourſelves and others, and to give riſe to infinite reveries. But we ſhould take care how we draw from theſe ſources demonſtrations that might be uſed, by infidels, as arguments to overthrow the hiſtory of the Jews; a people the moſt ſtupid, moſt credulous, and oſtentatious of all others. In the mean time, the pagan philoſophers themſelves aſſerted, that it was a god who invented the fable: ſo much they were convincined of its ingenuity, and of its ſtrong tendency to inſtruct mankind in their duty.

Mythology therefore, when properly treated, begins with making learned reſearches into the real origin of fable, of paganiſm, and of that idolatry which was its conſequence. It recurs for this purpoſe even to the beginning of the world: and after finding that Laban, the father-in-law of the patriarch Jacob, was a maker of idols; and that he had his little images, or houſhold gods, which he formed of baked earth, and which ſhews that idolatry exiſted in the greateſt antiquity; it then explains *coſmogony*, and *theogony*, or the belief that the firſt inhabitants of the earth entertained of the creation of the univerſe, and what the pagan theology taught of the genealogy of their falſe gods. It begins with the tradition of the Chaldeans, a people ſo ancient, that Nimrod was their firſt king; but at the ſame time ſo credulous and ſuperſtitious, that we may regard them as the authors of all thoſe fables, and the propagators of all thoſe viſions, that have ſince blinded human reaſon. According to this tradition, a monſter named *Oannes*, or *Oes*, half fiſh and half man, ſprang from the ſea, before the chaos was completely diſperſed, and gave laws to the Chaldeans. A woman called *Omorka*, reigned over all the earth. *Bel* cut her in two, and made of one moiety the heavens, and of the other the earth. They likewiſe invented the two primitive beings, of which the good one, who was named *Oraſmaſdes*, had the direc-

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tion of heaven; and the other, called *Arimanius*, that of hell.

The ſcience of mythology then teaches the theogony of the Phœnicians; concerning whom it draws great lights from Sanchoniathon, a prieſt of Beryte, who lived before the Trojan wars, more than four hundred years before Heſiod and Homer, and of whom Euſebius has preſerved conſiderable fragments. From thence it paſſes to the theogony of the Egyptians; of whom *Thot* or *Thaut*, the founder of that nation, was likewiſe, they ſay, their firſt hiſtorian; that Sanchoniathon even copied from him; and of whom we find many relations in the Greek hiſtorians, eſpecially in Herodotus, Diodorus Siculus, and in Euſebius of Cæſarea. It then examines the theogony of the Atlantides, who dwelt on the weſtern part of Africa, and of whom Diodorus alone has preſerved any account. From thence it proceeds to the theogony of the Greeks, which is far better known to us, as we find accounts of it, more or leſs particular, in numberleſs Greek and Latin writers. This theogony had the ſame foundation as that of the Romans; the latter having only extended it, by adding to the Greek divinities certain gods or demigods, formed of their heroes, and certain ſymbolic and allegoric divinities, which mythology explains at the ſame time: and it is on this occaſion that it enters into a particular explication of the coſmogony and theogony of Ovid; whoſe book of metamorphoſes contains as copious deſcriptions as we could deſire of the fables of the ancients: what was their belief concerning the habitations of the bleſſed after their death, or of the Elyſian fields; as well as of their hell or tartarus; of the dog Cerberus; of the ferryman Charon; of the furies; of the four rivers, Cocytus, Lethe, Phlegethon, and Styx, which water the tartarian regions, *&c.* The learned have likewiſe made many inquires, and many ingenious diſcoveries, concerning the theogony of the ancient Germans, Celts, the Scythian and Hyperborean nation. In the laſt place, this ſcience furniſhes great lights on the theogony of the Bramins, the Troglodytes, the Indians, the Chineſe, and even the Americans; all which it concludes with a regular and minute examination of the pagan theology, and particularly that of the poets.

All theſe matters being well digeſted in the minds of thoſe who would make a regular ſtudy of pagan theology, they continue their reſearches into the time, the epoch and place of the real origin of paganiſm and idolatry; and they prove that the pagans began by adoring the heavenly bodies, the ſtars and planets. They next examine into the progreſs of idolatry: what were the temples of the pagans, their altars, their incloſures, their ſacred groves, their aſylums, the idols and ſtatutes of their deities; in what manner they were repreſented; what were their ſacrifices, the victims that were offered; what were the ſacred veſſels, the cenſers and other inſtruments that were uſed in the ſacrifices, libations, and other religious ceremonies: concerning the prieſts, prieſteſſes, and other attendants on the ſervice of each divinity: what were the feſtivals that were celebrated among the Greeks and Romans, as well as among the orientals; what the days of penitence and ſupplication, the feaſts or the gods of lectiſternia, their invocations or incantations, and exorciſms, the religious ceremonies obſerved at laying the foundations of cities, *&c.*

Divination, or the prediction of future events, a weakneſs that has at all times poſſeſſed the human mind, forms alſo an important article of pagan theology. It is therefore in this place, that mythology conſiders the nature of *Oracles*; and in particular, 1. The oracle of Dodono, the moſt ancient of Greece; 2. That of Jupiter, Hammon or Ammon, in Libya; 3. That of Jupiter Philius; 4. That of Apollo, both of Heliopolis; 5. That of Apollo of Delphos; 6. That of Trophonius in Bœotia; 7. That of Venus of Aphaca, a country between Byblos and Heliopolis, ſituate on a ſmall lake; and a great number of other oracles of leſs note, diſperſed over Greece and other countries. It alſo examines in what manner theſe oracles gave their anſwers, the ceremonies that were obſerved in conſulting them, the frantic emotions of the prieſteſs Pythia on her tripod; and thoſe of other prieſts. It then endeavours to determine if there ever were in fact any Sibyls, which, whatever has been ſaid, is ſtill very doubtful; it draws, however, from all the ſources of antiquity, a kind of hiſtory of theſe Sibyls, and of their prophecies. It next paſſes to the examen of the nature of auguries, auſpices, haruſpices, preſages, prodigies, and phenomena, of expiations and ablutions, of the magic and aſtrology of the ancients, *&c.* Whoever has throughly ſtudied all theſe objects, is fully provided with the preliminary knowledge that is neceſſary to enable him to proceed ſteadily and ſecurely through the darkneſs of ancient mythology, and he may thereby advance more confidently to the examination of the nature of the pagan divinities themſelves.

The celebrated treatiſe of Cicero *De natura Deorum* will here furniſh great lights: but modern authors who have treated on theſe matters, have not been contented with this alone: they have, ſo to ſay, extracted the eſſence of all antiquity, of which they have formed ſyſtems; but unluckily theſe ſcarce ever agree with each other. As philoſophers, it is of very little importance for us to know what was the nature of theſe gods, ſeeing we know that they were merely fabulous: but as hiſtorians and antiquaries, it concerns us to know what was the nature that was attributed to them in general; and, in particular, what were the origin, genealogy, rank, functions, authority, and operations, that were attributed to each divinity; and it is on theſe matters that we have ſtill ſome remarks to make.

The gods of the ancient Greeks and Romans were all either *Dii majorum gentium*, or *Dii minorum gentium*; that is, of the firſt or ſecond order. The former were alſo called *conſentes*, *magni conſultores*, &c. According to Ennius they were twelve in number, and are included in theſe verſes:

Juno, Veſta, Minerva, Ceres, Diana, Venus, Mars,
Mercurius, Jovis, Neptunus, Vulcanus, Apollo.

To theſe were added eight others under the title of *ſelecti*, which were Sol, Luna, Tellus, Genius, Janus, Saturnus, Liber, and Pluto. The ſecond order, or *minorum gentium*, were called Adſcriptitii, Medioximi, Minuſculi, Putatitii, Indigetes, Semones, *&c.* the principal of which were Æſculapius, Bacchus, Caſtor, Fauna, Hercules,

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les, the Lares or Penates, Pollux, Quirinus, Semo Sancus or Dius Fidius, &c.

According to the second division, all their divinities were classed into, 1. Celestial gods, 2. Terrestrial gods, 3. Sea gods, and 4. The Infernal deities, or *inferi*. The celestial gods were Jupiter, Juno, Apollo, Aurora, Cupid, Cybele, the Graces, Hebe, Iris, Luna, Mars, Mercury, Minerva, Nemesis, Saturn, Themis, Venus, &c. The terrestrial gods were Æolus, Astræus, Astræa, Ceres, Diana, the Fauni, Feronia, Flora, Janus, Momus, the Muses, Pales, Pan, Pomona, Priapus, the Satyrs, Silenus, Silvanus, the god Terminus, Vesta or Rhea, Berecynthia, Vulcan, Harpocrates, &c. The sea-gods were Neptune, Amphitrite, Thetis, Canopus, Glaucus, Ino, the Nereids, Nereus, Oceanus, Palæmon, Triton, &c. The infernal gods were Pluto, Proserpine, Charon, Minos, Æacus, Rhadamanthus, the Furies, Death, Night, the Fates, Plutus, &c.

The third division ranged the divinities according as they presided, 1. Over the pregnancy of women (*Prægnantium*;) 2. At parturitions (*Parturientium*;) 3. At births (*Nascentium*;) 4. At adulteries; 5. At marriages: To which they added, 7. Dii morales, or moral gods; and 7. Funeral gods. The gods of pregnancy were Pilumnus, Intercidona, and Deverra: the gods of parturition, Juno, Lucina, Diana, Egerio, Prosa, Postverta, Menagenata, Latona, the gods that were called Nixi, or of labour, &c. The gods of birth were Janus, Opis, Nascion, Cunina, Carmenta, Vaginianus, Levana, Rumia, Potina, Educa, Ossilago, Carnea, Nundina, Statilinus, Fabulinus, Paventia, &c. The gods of adultery were Juventus, Agenoria, Strenua, Stimula, Horta, Quies, Murcia, Adeona, Abeona, Voluptas, Orbona, Pellonia, Numeria, Camoena, Sentia, Angerona, Heres, Martea, Laverna, the god Averruncus, Consus, Catius, Volumnus and Volumna, Honorius, Aius Locutius, &c. The nuptial gods were Diana, Domiduca, Domitius, Hymenæus or Hymen, Jugatinus, Jupiter perfectus, Juno perfecta, Juno cinxia, Juna unxia, Lucina, Manturna, Mutinus, Dea Mater prima, Suada, Thalassius, Venus, &c. The moral gods were called Virtus, Honor, Fides, Spes, Justitia, Pietas, Misericordia, Clementia, Pudicitia, Veritas, Mens, Concordia, Pax, Salus, Felicitas, Libertas, Pecunia, Risus, Invidia, Contumelia, Impudentia, Calumnia, Fraus, Discordia, Furor, Fama, Fortuna, with all their epithets good or bad, Febris, Pavor and Palor, Paupertas, Necessitas, Tempestas, Silentium, &c. The funeral gods were Pluto, Libitina, Nænia, Death, the Fates, &c.

Hesiod indeed pretends that all these gods derived their origin from chaos; but we have already pointed out more just sources. It is almost incredible to what a prodigious number the superstition and weakness of the Greeks and Romans multiplied these divinities; there have been thirty thousand of them enumerated. It will not be expected that we should here attempt to describe them, nor will it be remarkable if we have forgot to mention even some of the first rank: Although, vast as this company of gods is, mythology does not omit to trace the history of the greatest part of them, as is taught by paganism; and they who are desirous of particular information in these matters may consult with advantage the theogony of Hesiod, the catalogue of Apollodorus, the metamorphoses of Ovid, the fables of Hygina, Lylii Gregorii Gyraldi Syntagma de Diis Gentilium, the mythology of Natalis Comes, the books of Gerard Vossius de Idolatria Gentilium, Johannis Boccatii Genealogia Deorum, the Pantheon of Pomey, the history of heaven by Abbe Pluche, the historic explanation of fables by Abbe Banier, and numberless other works of the same kind in all languages.

There were still many other distinctions, of which the pagans made use to mark the rank, the functions and nature of their several divinities. For example, the goddess Vesta, or the mother of all the gods, was adored by all people in general. Mars, Bellona, Victoria, Fortunata, &c. assisted all parties. The topical gods, on the contrary, were adored in particular countries only; as Astarte in Syria, Derceto and Semiramis among the Assyrians, Isis and Osiris by the Egyptians, Quirinus at Rome, &c. The title Semones, which was given to a certain class of divinities, was doubtless derived from Semi-homines, that is, demi-men; and signified the same as semi-dii, or demi-gods. These were monarchs and illustrious heroes, or those great men who were the founders of cities and nations, that were deified by way of apotheosis. Pythagoras had taught the Chaldeans the doctrine of transmigration; and that, after their death, those who were virtuous would be elevated to the rank of divinities. This doctrine was adopted by all the pagan world. The apotheosis, after they had erected temples and altars to the new gods, was celebrated with much solemnity. In the last ceremony, an eagle was fixed on the catafalk, or funeral pile, on which was placed the image of the hero; and when the pile began to burn, the eagle was let loose, who, mounting into the air with the flames, seemed to carry the soul of the departed hero up to heaven.

Mythology informs us also, who those persons were that antiquity regarded as the children of the gods, such as Theseus, Hippolytus, Paris, &c.; what the pagans believed with regard to the nature of their Genii and Demons, of their Dryades, Hamadryades, Nymphs, Tritons, Sirens, Fauns, Sylvans, Centaurs, and other subaltern divinities; and in this manner it explains all the systems of the positive religion of the Greeks and Romans. They who are desirous of extending their knowledge of paganism still further, of knowing the dogmas of each particular people, what were their gods, and the various manners in which they were worshipped, such as Apis, Isis, Osiris, &c. the adoration of crocodiles and onions, &c. among the Egyptians, must study the different theogonies of these people; and notwithstanding all the informations which ancient and modern authors afford, this study is yet boundless, and attended with many difficulties and uncertainties: Though it appears demonstrative, that the origin of paganism, and of idolatry in general, was derived from the Chaldeans, from whom the Egyptians drew that doctrine which they after transmitted to all other nations; and consequently that the primordial divinities were the same, under different denominations, among all the idolatrous nations of the earth.

The nature of this work will not permit us to descend to further particulars. But to give our readers an idea

of

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of the manner in which mythology treats its ſubjects, and of the method that ſhould be obſerved in ſtudying fable, or the hiſtory of the gods of antiquity, we ſhall here give, by way of example, a curſory deſcription of Parnaſſus and its inhabitants.

Parnaſſus was a mountain of Phocis, that had two ſummits, one of which was called Tithoreus, and the other Hyampeus. Others ſay, that one of theſe hills was named Helicon, and the other Cytheron; and that it is an error to imagine, that Helicon was a mountain of Bœotia. However that be, this double hill was conſecrated to Apollo and the Muſes, who there held their uſual reſidence. According to fable, there had been a remarkable combat on this hill, between Helicon and Cytheron. Whoever ſlept on Parnaſſus, when he waked, became a poet. Apollo had there a temple. There alſo was the fountain Caſtalia, into which Apollo had metamorphoſed a nymph that he loved, and had given to its waters the power of making all who drank of them poets. At the foot of Parnaſſus flowed the river Hippocrene, that had the ſame virtue; and the ſource of which was opened by a ſtroke of the foot of the horſe Pegaſus. This river nouriſhed a great number of ſwans, that were regarded as ſacred. Pegaſus was a winged horſe, that belonged to Apollo, and grazed on the ſummit of Parnaſſus. He ſprang from the blood of Meduſa, when Perſeus cut off her head, which was placed among the ſtars. Such was the delicious abode of Apollo, the ſon of Jupiter and Latona, who was born, with his twin ſiſter Diana, in the iſland Delos. He killed the Cyclops, who forged the thunderbolts with which Jupiter had overthrown his ſon Æſculapius; but for that preſumption, he was forced to leave heaven, and become an inhabitant of the earth. He guarded the oxen of Admetus; he aided Neptune to build the walls of Troy, and Alcotheus in forming the labyrinth. He killed the dragon or ſerpent Python. He invented Muſick and phyſick; and was honoured as the god of poets and phyſicians. He was repreſented as a young man without a beard, his head ſurrounded with rays, and bearing in his hand a bow, or a lyre. As the ancients denoted the ſun by the name of Apollo, they ſometimes repreſented him alſo as ſeated in a chariot, drawn by two white horſes, preceded by Aurora and the ſtar Venus: Phaeton his ſon, being deſirous of conducting theſe horſes, was thrown into the ſea. Apollo was alſo called Phœbus, Titan, and Sol. He is known to have had amours with Arſinoe, Corycia, Melœne, Cyrene, Mantho, Sinope, Calliope, and others; by whom he had Delphe, Naxe, Miletus, Arabe, Garamas, Sirus, Linus, Orpheus, and other children. He had peculiar honours paid him in the Pythian games at Delphos, and in the ſecular games at Rome.

The Muſes were the companions of Apollo in his rural abode. They were likewiſe called the learned ſiſters; as alſo the Camœnion, Heliconian, Parnaſſian, Aonian, Pierian, Pegaſian, Aganippian, Theſpian, Libethrian, and Caſtalian ſiſters. They were the daughters of Jupiter and Mnemoſyne, and were regarded as the goddeſſes of ſciences and arts in general. There were nine of theſe muſes; to whom they attributed, 1. to Clio, hiſtory, 2. to Melpomene, tragedy, 3. to Thalia, comedy, 4. to Euterpe, flutes and other pneumatic inſtruments of muſick, 5. to Terpſichore, the harp and the dance, 6. to Erato, the lyre and the lute, 7. to Calliope, heroic verſe, 8. to Urania, aſtronomy, and 9. to Polyhymnia, rhetoric and eloquence. The Graces alſo ſometimes quitted Venus to pay their court to Apollo.

Such was the idea they entertained of Parnaſſus and its inhabitants. There is no doubt but that, under theſe fabulous repreſentations, theſe ſenſible images, were concealed allegoric and moral meanings; nor can it be denied but that their method of cultivating the arts and ſciences, by this manner of expreſſing their ideas, was as ingenious and pleaſing as it is poſſible to imagine. Every other ſubject that paganiſm embraced it treated with the ſame genius, and in a manner equally pleaſing; and though that religion was altogether fallacious, yet we muſt allow that it was extremely well calculated to promote the polite arts, by thoſe refined, noble, graceful, brilliant images, by thoſe charming ſubjects, which it conſtantly preſented, and which it ſtill offers to the poet, painter, ſculptor, and every other artiſt.

But this was not a power ſufficiently ſtrong to ſecure paganiſm againſt that viciſſitude, that decline and diſſolution, which finally attends all the productions of this world. This religion, which had ſubſiſted near five thouſand years, and almoſt from the origin of the human race, gradually declined in proportion as the lights of Chriſtianity and philoſophy illumined the minds of mankind. For though the pagan religion, and the fables on which it was founded, were pleaſing and favourable to the polite arts, they were not however calculated to ſatisfy the minds of philoſophers, nor to promote the real good of mankind, by ſecuring their temporal and eternal happineſs. It is even ſurpriſing that ſo great a genius as the emperor Julian ſhould attempt to revive the embers of paganiſm, which inſenſibly declined, and had received a mortal blow at the beginning of the fourth century by the emperor Conſtantine the great. Julian employed all the reſources of his imagination, of his eloquence, of his power, and even of his own fatal example, to revive it; but in vain. The fatal period of paganiſm was arrived, and nothing could ſave it from deſtruction. The furious Theodoſius, to whom bigotted prieſts and hiſtorians have aſſigned the name of Great, totally overthrew it toward the cloſe of the ſame century, deſtroyed thoſe temples and altars which yet ſubſiſted, diſperſed its colleges, and exterminated its prieſts. From that dire epoch, nothing of paganiſm has remained, except ſome ruins diſperſed in the remote parts of the earth, and among people wretched and almoſt unknown; where this religion, once ſo flouriſhing and univerſal, is now degenerated into groſs and diſguſtful idolatry.

MYURUS, in medicine, an epithet for a ſort of ſinking pulſe, when the ſecond ſtroke is leſs than the firſt, the third than the ſecond, and ſo on.

N.

NABOB, a viceroy or governor of one of the provinces of the Mogul's empire, in India.

NABONASSAR, or *Æra of* NABONASSAR. See ASTRONOMY, p. 493.

NADIR, in aſtronomy, that point of the heavens which is diametrically oppoſite to the zenith, or point directly over our heads. See ASTRONOMY, p. 435.

NÆVI, in ſurgery, marks or excreſcences made on the ſkin of an infant before its birth, vulgarly ſuppoſed to be occaſioned by the imagination of the mother.

NAHUM, or *the prophecy of* NAHUM, a canonical book of the Old Teſtament.

Nahum, the ſeventh of the twelve leſſer prophets, was a native of Elkoſhai, a little village of Galilee. The ſubject of his prophecy is the deſtruction of Nineveh, which he deſcribes in the moſt lively and pathetic manner; his ſtyle is bold and figurative, and cannot be exceeded by the moſt perfect maſters of oratory. This prophecy was verified at the ſiege of that city by Aſtyages, in the year of the world 3378, 622 years before Chriſt.

NAIADS, in mythology, the nymphs of the fountains. See MYTHOLOGY.

NAIANT, in heraldry, a term uſed in blazoning fiſhes, when borne in an horizontal poſture, as if ſwimming.

NAJAS, in botany, a genus of the monœcia monandria claſs. The calix of the male is cylindrical and bifid; the corolla conſiſts of four ſegments; and there are no filaments: The female has neither calix nor corolla, but one piſtil and an ovated capſule. There is only one ſpecies, *viz.* the marina, found in the European ſeas.

NAIL, *unguis*, in anatomy. See ANATOMY, p. 256.

NAILS, in building, *&c.* ſmall ſpikes of iron, braſs, *&c.* which being druve into wood, ſerve to bind ſeveral pieces together, or to faſten ſomething upon them.

NAIL, is alſo a meaſure of length, containing the ſixteenth part of a yard.

NAIRN, a borough and port-town of Scotland, eighteen miles eaſt of the town of Inverneſs.

NAISSANT, in heraldry, is applied to any animal iſſuing out of the midſt of ſome ordinary, and ſhewing only his head, ſhoulders, forefeet and legs, with the tip of his tail; the reſt of his body being hid in the ſhield, or ſome charge upon it; in which it differs from iſſuant, which denotes a living creature ariſing out of the bottom of any ordinary or charge.

NAKED SEEDS, in botany, are thoſe that are not incloſed in any pod or caſe.

NAMA, in botany, a genus of the pentandria digynia claſs. The calix conſiſts of five leaves, and the corolla of five ſegments; and the capſule has one cell and two valves. There are two ſpecies, none of them natives of Britain.

NAME, denotes a word whereby men have agreed to expreſs ſome idea; or which ſerves to ſignify a thing or ſubject ſpoken of. See GRAMMAR.

NAMUR, a ſtrong city of the Auſtrian Netherlands, capital of the province of Namur, ſituated at the confluence of the Sambre and Maeſe; E. long. 4° 50′, N. lat. 50° 30′.

NANCY, the capital of Lorrain in Germany, ſituated in E. long. 6°, N. lat. 48° 44′.

NANFIO, one of the iſlands in the Archipelago, ſixteen miles round, and ſituated in E. long. 26°, N. lat. 35°.

NANKING, the capital of the province of Nanking, and formerly of the Empire of China, is ſituated in E. long. 118° 30′, N. lat. 32°.

NANSAMUND, a county of Virginia, in North America, ſouth of the Iſle-of-Wight county, through which the river of Nanſamund runs.

NANTZ, a city of France in the province of Brittany, ſituated on the river Loire, in W. long. 1° 30′, N. lat. 47° 15.

NANTWICH, a market town of Cheſhire, ſituated ſeventeen miles ſouth-weſt of Cheſter.

NAPÆA, in botany, a genus of the monadelphia polyandria claſs. The calix is ſimple and cylindrical; and the capſule contains one ſeed. There are two ſpecies, none of them natives of Britain.

NAPHTHA, in natural hiſtory, a fluid mineral body, of a thin conſiſtence, bright and pellucid, of a ſtrong ſmell, very readily inflammable, and, when pure, burning away without leaving any reſiduum.

The naphtha is found in conſiderable quantities floating on the water of certain ſprings, principally breaking out at the ſides of hills in Perſia, Tartary, and ſome parts of the empire of China; where if a lighted candle be held near the ſurface, it takes fire and overſpreads the ſurface of the water for a great extent, with a ſtrong white flame, and emits a very diſagreeable ſmell. The genuine naphtha is very rare in Europe; it is not known to be any where naturally produced here, and what we ſee of it is generally ſophiſticated. Diſtilled by the retort, it yields an oil ſomewhat thinner than it was originally, and of a weaker ſmell. The ſubſtance remaining at the bottom of the retort, has much the reſemblance of amber; and Dr Hill thinks it highly probable, that the origin of all the amber is from the ſame ſort of principle; nay, he tells us that he has ſucceeded

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ceeded ſo far in an attempt to make amber by this fluid and an acid drawn from the crude pyrites, that he has produced a friable ſomewhat pellucid matter, having all the properties of amber except its hardneſs and clearneſs, and yielding a true ſalt and oil of amber on diſtillation.

The medicinal virtues of the naptha are the ſame with the common petroleum, but in a more remiſs degree. It is uſed externally on many occaſions in Perſia; and is taken inwardly, a few drops for a doſe, in colics. The principal uſe made of it, however, is burning in lamps, for which purpoſe it is very proper.

MAPIER's, or NEPER's BONES. See NEPER.

NAPLES, the capital of the kingdom of Naples: ſituated in E. long. 15°, N. lat. 41°.

The kingdom of Naples is one of the Sicilies; it is the ſouth-eaſt part of Italy, and is ſituated between 14° and 19° E. long. and between 38 and 34° N. lat. being bounded by the gulph of Venice on the north-eaſt, by the Mediterranean ſea on the ſouth-eaſt, by Sicily and the Tuſcan ſea on the ſouth-weſt, and by the Pope's territories on the north-weſt; and divided from the iſlands of Sicily only by the narrow ſtraight of Pharo or Meſſina.

NARBARTH, a town of Pembrokeſhire, in ſouth Wales, ſituated ten miles north-eaſt of Pembroke.

NARBONNE, a city of France, in the province of Languedoc: ſituated in E. long. 2° 40′, N. lat. 43° 18′.

NARBOROUGH, an iſland of South-America, in the Pacific Ocean, ſituated on the coaſt of Chili, in W. long. 85°, S. lat. 45′.

NARCISSUS, the DAFFODIL, in botany, a genus of the hexandria monogynia claſs. The corolla conſiſts of ſix leaves, and the nectarium of one entire funnel-ſhaped leaf; and the ſtamina are ſituate within the nectarium. There are 13 ſpecies, only two of which are natives of Britain, *viz.* the poeticus, common pale daffodil, or primroſe peerleſs; and the pſeudo-narciſſus, or wild Engliſh daffodil.

NARCOTICS, in medicine, ſoporiferous medicines, which excite a ſtupefaction.

Narcotics, called alſo hypnotics, anodynes, or ſtupefactives, are ſaid, by Hoffman, to be ſuch kind of remedies as, by their ſubtle, noxious, and deleterious exhalations, diminiſh, or quite deſtroy, the ſenſe and motion of the ſolid parts. Among narcotics, the moſt eminent are thoſe which are uſually prepared for medicinal uſes of the whole poppy, eſpecially opium; as alſo all thoſe prepared of mandragoras, hyoſcyamus, ſtramonium, and datura.

NARDO, a port-town of Italy, in the kingdom of Naples: E. long. 19°, N. lat. 40° 33′.

NARDUS, in botany, a genus of the triandria monogynia claſs. It has no calix, and the corolla conſiſts of two valves. There are five ſpecies, only one of which, *viz.* the ſtricta, or malt-graſs is a native of Britain.

NARRATION, in oratory and hiſtory, a recital or rehearſal of a fact as it happened, or when it is ſuppoſed to have happened. See DESCRIPTION.

NARWAL, in ichthyology. See MONODON.

NARVAR, a city of the hither India, the capital of the province of Narvar: E. long. 79°, N. lat. 25′.

NASIAS, in anatomy, a thin bone, making the upper part of the noſe. See ANATOMY, p. 160.

NASSAU, the capital of the county of the ſame name in Germany: E. long. 7° 25′, N. lat. 50° 21′.

NASSUS, in ichthyology. See CYPRINUS.

NATES, in anatomy, a term expreſſing thoſe two fleſhy exterior parts of the body vulgarly called the buttocks.

NATES CEREBRI. See ANATOMY, p. 286.

NATION, a collective term, uſed for a conſiderable number of people inhabiting a certain extent of land, confined within fixed limits, and under the ſame government.

NATIVE, a perſon conſidered as born in a certain place which was the proper reſidence of his parents, and where he received his education.

NATIVITY, or NATAL DAY, the day of a perſon's birth: The word nativity is chiefly uſed in ſpeaking of the ſaints, as the nativity of St. John the Baptiſt, *&c.* But when we ſay the Nativity, it is underſtood of that of Jeſus Chriſt, or the feaſt of Chriſtmas.

NATOLIA, the modern name of the Leſſer Aſia, being the moſt weſterly part of Turkey in Aſia, and conſiſting of a large peninſula, which extends from the river Euphrates, as far as the Archipelago, the ſeas of Marmora, the ſtraits of Galipoli and of Conſtantinople, which ſeparate it from Europe on the weſt. It is bounded on the north by the Black-Sea, and on the ſouth by the Mediterranean ſea.

NATRIX, in zoology. See COLUBER.

NATRUM, the nitre of the ancients, in natural hiſtory, is a genuine, pure and native ſalt, extremely different from our nitre, and indeed from all the other native ſalts; it being a fixed alkali, plainly of the nature of thoſe made by fire from vegetables, yet capable of a regular cryſtallization, which thoſe ſalts are not. It is found on the ſurface of the earth, or at very ſmall depths within it; and is naturally formed into thin and flat cakes or cruſts, which are of a ſpungy or cavernous ſubſtance, very light and friable, and, when pure, of a pale browniſh-white; but as its ſpungy texture renders it very ſubject to be fouled by earth received into its pores, it is often met with of a deep dirty brown, and not unfrequently reddiſh.

Natrum, whether native or purified, diſſolves in a very ſmall quantity of water; and this ſolution is, in many parts of Aſia, uſed for waſhing; where it is alſo made into ſoap, by mixing it with oil. Natrum reduced to powder, and mixed with ſand or flints, or with any other ſtone of which cryſtal is the baſis, make them readily run into glaſs. Gold heated red hot, and ſprinkled with a ſmall quantity of this ſalt, melts immediately; ſilver ignited and ſprinkled with it, melts in the ſame manner; as does alſo iron, copper, and the regulus of antimony, which melt much more eaſily than they otherwiſe would do. Mercury will not be mixed with it by any art, and indeed will not amalgamate with metals if only a little of this ſalt be added. It is found in great abundance in many parts of Aſia, where the natives ſweep

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it up from the ſurface of the ground, and call it ſoap-earth. The earlieſt account we have of it is in the Scriptures, where we find that the ſalt called nitre in thoſe times would ferment with vinegar, and had an abſterſive quality, ſo that it was uſed in baths and in waſhing things. Solomon compares the ſinging of ſongs with a heavy heart, to the contrariety of vinegar and nitre; and Jeremiah ſays, that if the ſinner waſh himſelf with nitre, his ſin is not cleanſed off. Theſe are properties that perfectly agree with this ſalt, but not at all with our ſalt-petre.

NATURAL HISTORY.

NATURAL HISTORY, is that ſcience which not only gives compleat deſcriptions of natural productions in general, but alſo teaches the method of arranging them into Claſſes, Orders, Genera, and Species. This definition includes Zoology, Botany, Mineralogy, *&c.* But, in a work of this kind, we thought it would be eaſier, and more advantageous to the reader, to treat theſe branches of natural hiſtory ſeparately under their reſpective names. See BOTANY, *&c.* Under the title of NATURAL HISTORY, therefore, we ſhall confine ourſelves to ZOOLOGY, or that part of it which relates to *Animals*. It is likewiſe neceſſary to mention in this place, that we have given the deſcriptions and characters of animals under their proper names. The ſcientific part of the ſubject, therefore, or the method of inveſtigating the genera or ſpecies of animals, by means of natural or artificial arrangement, only remains to be explained.

In order to abridge the ſtudy of zoology, many methods of reducing animals to claſſes, genera, and ſpecies, have been invented. But, as that of Linnæus is undoubtedly the beſt, the moſt extenſive, and the leaſt underſtood, we ſhall give a brief account of it.

Linnæus divides the whole animal kingdom into 6 claſſes. The characters of theſe 6 claſſes are taken from the internal ſtructure of animals, in the following manner.

CLASS I. MAMMALIA, includes all animals that ſuckle their young. The characters of this claſs are theſe:—The heart has two ventricles and two auricles; the blood is red and warm; and the animals belonging to it are *viviparous*.

CLASS II. AVES, or BIRDS.—The characters are the ſame with thoſe of Claſs I. excepting that the animals belonging to it are *oviparous*.

CLASS III. AMPHIBIA, or AMPHIBIOUS ANIMALS.—The *heart* has but one ventricle and one auricle; the *blood* is red and cold; and the animals belonging to this claſs have the command of their *lungs*, ſo that the intervals between *inſpiration* and *expiration* are in ſome meaſure *voluntary*.

CLASS IV. PISCES, or FISHES:—The *heart* has the ſame ſtructure, and the *blood* the ſame qualities with thoſe of the *Amphibia*; but the animals belonging to this claſs are eaſily diſtinguiſhed from the Amphibia, by having no ſuch voluntary command of their *lungs*, and by having external *branchiæ* or *gills*.

CLASS V. INSECTA, or INSECTS.—The *heart* has *one ventricle*, but no *auricle*; the *blood* is cold and white; and the animals are furniſhed with *antennæ*, or *feelers*.

CLASS VI. VERMES, or WORMS.—The characters are the ſame with thoſe of Claſs V. only the animals have no antennæ, and are furniſhed with *tentacula*.

The *Firſt Claſs*, MAMMALIA, is ſubdivided into 7 ORDERS; the characters of which are taken from the number, ſtructure, and ſituation of the TEETH.

ORDER I. The PRIMATES, have 4 inciſores, or *fore-teeth*, in each jaw, and one *dog-tooth*. N. B. By *one* dog-tooth, Linnæus means one on each ſide of the fore-teeth in both jaws.—This order includes 4 genera, *viz.* Homo, Simia, Lemur, Veſpertilio. See theſe articles.

ORDER II. The BRUTA, have no *fore-teeth* in either jaw.—This order includes 6 genera, *viz.* Elephas, Trichechus, Bradypus, Myrmecophaga, Manis, Daſypus. See theſe articles.

ORDER III. The FERÆ, have, for the moſt part, 6 *conical fore-teeth* in each jaw.—This order includes 10 genera, *viz.* Phoca, Canis, Felis, Viverra, Muſtela, Urſus, Didelphis, Talpa, Sorex, Erinaceus. See theſe articles.

ORDER IV. The GLIRES, have 2 fore-teeth in each jaw, and no *dog-teeth*.—This order includes 6 genera, *viz.* Hyſtrix, Lepus, Caſtor, Mus, Sciurus, Noctilio. See theſe articles.

ORDER V. The PECORA, have no *fore-teeth* in the upper jaw, but 6 or 8 in the under-jaw.—This order includes 6 genera, *viz.* Camelus, Moſchus, Cervus, Capra, Ovis, Bos. See theſe articles.

ORDER VI. The BELLUÆ, have *obtuſe fore-teeth* in each jaw.—This order includes 4 genera, *viz.* Equus, Hippopotamus, Sus, Rhinoceros. See theſe articles.

ORDER VII. The CETE, or *whale kind*, have no uniform character in their teeth, being very different in the different genera; but are ſufficiently diſtinguiſhed from the other orders of Mammalia, by living in the ocean, having pectoral fins, and a fiſtula or ſpiraculum upon the head.—This order includes 4 genera, *viz.* Monodon, Balæna, Phyſeter, Delphinus. See theſe articles.

The *generic* characters of the Mammalia are, like thoſe of the orders, almoſt entirely taken from the TEETH, excepting

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excepting the Veſpertilio, which, beſides the character of of the order derived from the teeth, has this further mark, that there is a membrane attached to the feet and ſides, by means of which the creature is enabled to fly;—the Hyſtrix, whoſe body is covered with ſharp ſpines;—and the whole order of Pecora, whoſe genera, beſides the characters taken from the teeth, are diſtinguiſhed into thoſe which have *horns*, thoſe which have *no horns*, and by peculiarities in the horns themſelves.

The *ſpecific* characters are very various, being taken from any part of the body which poſſeſſes a peculiar uniform mark of diſtinction. As examples of theſe characters are to be found under the proper name of each genus, it is unneceſſary to ſay any thing further concerning them in this place.

The *Second Claſs*, AVES, is ſubdivided into ſix Orders, the characters of which are taken chiefly from the ſtructure of the Bill.

Order I. The Accipitres, have a hooked bill, the ſuperior mandible, near the baſe, being extended on each ſide beyond the inferior; and in ſome, the ſuperior mandible is armed with *teeth*.—This order includes 4 ſpecies, *viz.* Vultur, Falco, Strix, Lanius. See theſe articles.

Order II. The Picæ, have a convex, compreſſed bill, reſembling a knife.—This order contains 22 genera, *viz.* Buphaga, Certhia, Corvus, Cuculus, *&c.* See theſe articles.

Order III. The Anseres, have an obtuſe bill, gibbous at the baſe, broadeſt at the point, covered with a ſmooth ſkin, and furniſhed with teeth: The *tongue* is fleſhy; and the toes are palmated, or webbed.—This order includes 12 genera, *viz.* Alca, Anas, Colymbus, Diomedia, *&c.* See theſe articles.

Order IV. The Grallæ, have a long, obtuſe, and ſomewhat cylindrical bill: The *tongue* is undivided, and fleſhy; and the *thighs* are naked. This order contains 18 genera, *viz.* Ardea, Fulica, Tringa, Charadrius, *&c.* See theſe articles.

Order V. The Gallinæ, have a convex bill; the ſuperior mandible is vaulted over the inferior, and the margin of the ſuperior mandible folds over the inferior one: The *noſtrils* are half covered with a convex cartilaginous membrane: The *rectrices*, or principal quill-feathers of the tail, are always more than twelve in number; and the *feet* are divided, but connected at the inmoſt joint.—This order contains 7 genera, *viz.* Didus, Phaſianus, Meleagris, Pavo, *&c.* See theſe articles.

Order VI. The Passeres, have a conical ſharp-pointed bill; and the *noſtrils* are oval, wide, and naked.—This order contains 15 genera, *viz.* Caprimulgus, Alauda, Columba, *&c.* See theſe articles.

The *generic* characters of this claſs are taken from peculiarities in the *bill*, the *noſtrils*, the *tongue*, the *feet*, the *feathers*, the *face*, the *figure* of the *body*, &c.

The characters which ſerve to diſtinguiſh the *ſpecies* are very various: For example, the *colour* of particular *feathers* or parts of *feathers*; *creſts* of feathers on the head, diſpoſed in different manners; the colour of the *cere* or *wax*; the colour of the *feet*; the ſhape and length of the *tail*; the number, ſituation, *&c.* of the *toes*; the colour and figure of the *bill*; &c.

The *Third Claſs*, AMPHIBIA, is divided into four Orders.

Order I. The Reptiles, have *legs*, and breathe by the *mouth*.—This order contains 4 genera, *viz.* Teſtudo, Draco, Lacerta, Rana. See theſe articles.

Order II. The Serpentes, have no *legs*, and breathe by the *mouth*.—This order contains 6 genera, *viz.* Crotalus, Boa, Coluber, Anguis, Amphiſbæna, Cœcilia. See theſe articles.

Order III. The Nantes, are furniſhed with *lungs*, and at the ſame time breathe by lateral *gills*; and the rays of their fins are cartilaginous.—This order contains 14 genera, *viz.* Accipenſer, Baliſtes, *&c.* See theſe articles.

Order IV. The Meantes, have both *lungs* and *gills*; and the *feet* are furniſhed with *toes* and *claws*.—This order contains but one genus, *viz.* the Siren. See Siren.

The *generic* characters of this claſs are taken from the general figure of the *body*; from their having *tails* or *no tails*; being covered with a *ſhell*; having *teeth* or *no teeth* in the *mouth*; being furniſhed with *wings*; having *covered* or *naked* bodies; from the number, ſituation, and figure of the *ſcuta* and *ſcales*; from the number and ſituation of the *ſpiracula*; from the ſituation of the *mouth*, &c.

The *ſpecific* characters are ſo very various, that it would be ſuperfluous to enumerate them.

The *Fourth Claſs*, PISCES, is ſubdivided into four Orders, the characters of which are taken from the ſituation of the *belly-fins*.

Order I. The Abodes, have no *belly-fins*.—This order contains 8 genera, *viz.* Ammodytes, Anarrhicas, Muræna, *&c.* See theſe articles.

Order II. The Jugulares, have the *belly-fins* placed before the *pectoral fins*.—This order includes 5 genera, *viz.* Callionymus, Blennius, Gadus, *&c.* See theſe articles.

Order III. The Thoracici, have the *belly-fins* placed *under* the *pectoral fins*.—This order comprehends 17 genera, *viz.* Gabius, Labrus, Sparus, *&c.* See theſe articcles.

Order IV. The Abdominales, have the *belly-fins* placed *behind* the *pectoral fins*. This order contains 17 genera, *viz.* Fiſtularia, Eſox, Clupea, Cyprinus, *&c.* See theſe articles.

The *generic* characters of this claſs are taken from peculiarities in the *head*, the *mouth*, the *teeth*, the *noſtrils*, the *rays* in the *membrane of the gills*, the *eyes*, the general *figure* of the *body*, the figure of the *tail*, the ſituation of the *ſpiracula*, &c.

The *ſpecific* characters are taken from peculiarities in all the parts above enumerated, and many others.

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The *Fifth Claſs*, INSECTA, is ſubdivided into 7 Orders, the characters of which are taken from the wings.

Order I. The Coleoptera, have *four wings*, the two ſuperior ones being cruſtaceous, and furniſhed with a *ſtraight future*.—This order comprehends 40 genera, *viz.* Attelabus, Scorabæus, Coccinella, Melœ, *&c.* See theſe articles.

Order II. The Hemiptera, have *four wings*, the two ſuperior ones being *ſemicruſtaceous*, and *incumbent*, i. e. the *interior edges* lie above one another.—This order includes 12 genera, *viz.* Blatta, Gryllus, Cicada, *&c.* See theſe articles.

Order III. The Lepidoptera, have *four wings*, all of them imbricated with *ſcales*.—This order contains 3 genera, *viz.* Papilio, Sphinx, Phalæna. See theſe articles.

Order IV. The Neuroptera, have *four wings* interwoven with veins, like a piece of *network*, and no *ſting* in the *anus*.—This order includes 7 genera, *viz.* Libella, Ephemera, Hemerobius, *&c.* See theſe articles.

Order V. The Hymenoptera, have the ſame characters with the former, only the *anus* is armed with *a ſting*. But this mark is peculiar to the *females* and *neuters*; for the *males* have no *ſting*.—This order comprehends 10 genera, *viz.* Apis, Formica, Veſpa, *&c.* See theſe articles.

Order VI. The Diptera have *two wings*, and two *clavated halteres* or *balances* behind each wing.—This order contains 10 genera, *viz.* Combylius, Aſilus, Tipala, *&c.* See theſe articles.

Order VII. The Aptera, have *no wings*. This order contains 14 ſpecies, *viz.* Acarus, Aranea, Pediculus, *&c.* See theſe articles.

The *Sixth Claſs*, VERMES, is divided into five Orders.

Order I. The Intestina, are the moſt *ſimple animals*, being perfectly *naked*, and without *limbs* of any kind.—This order contains 7 genera, *viz.* Lumbricus, Spinunculus, Faſciola, Gordius, Aſcaris, Hirudo, Mycine. See theſe articles.

Order II. The Mollusca, are likewiſe *ſimple naked animals*, without any *ſhell*; but they are *brachiated*, or furniſhed with a kind of *limb*.—This order comprehends 18 genera, *viz.* Aſcidia, Limare, Doris, Tethys, Aphrodita, Sepia, *viz.* See theſe articles.

Order III. The Testacea, have the ſame characters with thoſe of Order II. but are covered with a *ſhell*.—This order includes 39 genera, *viz.* Anomia, Cardium, Argonauta, Bulla, Buccinum, *&c.*

Order IV. The Lithophyta, are *compound animals*, fixed upon a *calcareous baſe* conſtructed by the creatures *themſelves*.—This order includes the corals, of which there are 4 genera, *viz.* Tubipora, Madrepora, *&c.* See theſe articles.

Order V. The Zoophyta, are *compound animals*, furniſhed with a kind of *flowers*, and having a vegetating *root* and *ſtem*.—This order contains 15 genera, *viz.* Spongia, Gorgonia, Tubularia, Hydra, *&c.* See theſe articles.

This ſhort explanation will enable any perſon who underſtands the Latin language to peruſe the Syſtema Naturæ of Linnæus without the aſſiſtance of a maſter; which was the principal object of this article.

N A T

N A T

Natural philosophy, that which conſiders the powers and properties of natural bodies, and their mutual actions on one another. See Mechanics, Optics, Astronomy, Hydrostatics, Pneumatics.

NATURALIZATION. See Law, Tit. x, 6.

NATURALS, among phyſicians, whatever naturally belongs to an animal, in oppoſition to non-naturals. See Non-naturals.

NATURE, according to Mr. Boyle, has eight different ſignifications; it being uſed, 1. For the Author of nature, whom the ſchoolmen call *Natura Naturans*, being the ſame with God. 2. By the nature of a thing, we ſometimes mean its eſſence; that is, the attributes which make it what it is, whether the thing be corporeal or not; as when we attempt to define the nature of a fluid, of a triangle, *&c.* 3. Sometimes we confound that which a man has by nature, with what accrues to him by birth; as when we ſay, that ſuch a man is noble by nature. 4. Sometimes we take nature for an internal principle of motion; as when we ſay, that a ſtone by nature falls to the earth. 5. Sometimes we underſtand, by nature, the eſtabliſhed courſe of things. 6. Sometimes we take nature for an aggregate of powers belonging to a body, eſpecially a living one; in which ſenſe phyſicians ſay, that nature is ſtrong, weak, or ſpent; or that, in ſuch or ſuch diſeaſes, nature left to herſelf will perform the cure. 7. Sometimes we uſe the term nature for the univerſe, or whole ſyſtem of the corporeal works of God; as when it is ſaid of a phœnix, or chimera, that there is no ſuch thing in nature. 8. Sometimes too, and that moſt commonly, we expreſs by the word nature a kind of ſemi-deity, or other ſtrange kind of being.

If, ſays the ſame philoſopher, I were to propoſe a notion of nature, leſs ambiguous than thoſe already mentioned, and with regard to which many axioms relating to that word may be conveniently underſtood, I ſhould firſt diſtinguiſh between the univerſal and the particular nature of things. Univerſal nature I would define to be the aggregate of the bodies that make up the world, in its preſent ſtate, conſidered as a principle; by virtue whereof they act and ſuffer, according to the laws of motion preſcribed by the Author of all things. And this makes way for the other ſubordinate notion; ſince the particular nature of an individual conſiſts in the general nature applied to a diſtinct portion of the univerſal

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univerſe; or, which is the ſame thing, it is a particular aſſemblage of the mechanical properties of matter, as figure, motion, *&c.*

NAVARINO, a port-town of European Turkey in the Morea, ninety miles ſouth-weſt of Corinth.

NAVARRE, a province of Spain, bounded by French Navarre on the north-eaſt, by Arragon on the ſouth-eaſt, by Old Caſtile on the ſouth-weſt, and by Guipuſcoa on the weſt: it is a mountanious country.

French Navarre, ſeparated from Spaniſh Navarre on the ſouth-weſt by the Pyrenees: it is only thirty miles long, and fifteen broad; being one of the moſt barren provinces in France.

NAVE, in architecture, the body of a church where the people are diſpoſed, reaching from the balluſter, or rail of the choir, to the chief door.

NAVEL, in anatomy, the centre of the lower part of the abdomen; being that part where the umbilical veſſels paſſed out of the fœtus to the placenta of the mother. See MIDWIFERY.

NAVEL-WORT, in botany. See COTYLEDON.

NAVEREINI, a town of Gaſcony, in France, ſixteen miles ſouth-eaſt of Bayonne.

NAVEW, in botany, See BRASSICA, of which it is a ſpecies.

NAVICULARE os, in anatomy. See ANAT. p. 186.

NAVIDAD, a port-town of Mexico, in the province of Mechoachan: W. long. 110°, and N. lat. 19°.

NAVIGATION.

NAVIGATION, is the art of conducting or carrying a ſhip from one port to another. In order to underſtand this ſcience, particularly the theoretical parts of it, it is neceſſary that the ſtudent be acquainted with the general principles of GEOMETRY, ASTRONOMY, and TRIGONOMETRY. See theſe articles.

Sect. I. *Of the* LOG-LINE *and* COMPASS.

1. THE method commonly made uſe of for meaſuring a ſhip's way at ſea, or how far ſhe runs in a given ſpace of time, is by the log-line, and half-minute glaſs.

2. The log is a flat piece of wood, in ſhape like a flounder, having a piece of lead faſtened to its bottom, which makes it ſtand or ſwim upright in the water: to this log is tied or faſtened a long line, which is called the log-line; and this is commonly divided into certain ſpaces, each of which is, or ought to be, ſuch a proportional part of a nautical mile (60 of which make a degree of a great circle on the earth) as half a minute (the time allowed for the experiment) is of an hour.

3. Theſe ſpaces are called knots, becauſe at the end of each of them there is a piece of twine with knots in it, inreeved between the ſtrands of the line, which ſhews how many of theſe ſpaces or knots are run out during the half minute. They commonly begin to be counted at the diſtance of about 10 fathom or 60 feet from the log; that ſo the log, when it is hove over board, may be out of the eddy of the ſhip's wake before they begin to count; and for the more ready diſcovery of this point of commencement, there is commonly faſtened at it a piece of red rag.

4 The log being thus prepared, and hove over board from the poop, and the line veered out (by the help of a reel, that turns eaſily, and about which it is wound) as faſt as the log will carry it away, or rather as the ſhip fails from it, will ſhew, according to the time of veering, how far the ſhip has run in a given time, and conſequently her rate of ſailing.

5. A degree of a meridian, according to the exacteſt meaſures, contains about 69.545 Engliſh miles; and each mile by the ſtatute being 5280 feet, therefore a degree of a meridian will be about 367200 feet; whence the $\frac{1}{60}$ of that, *viz.* a minute, or nautical mile, muſt contain 6120 ſtandard feet; conſequently, ſince $\frac{1}{2}$ minute is the $\frac{1}{120}$ part of an hour, and each knot being the ſame part of a nautical mile, it follows, that each knot will contain the $\frac{1}{120}$ of 6120 feet, *viz.* 51 feet.

6. Hence it is evident, that whatever number of knots the ſhip runs in half a minute, the ſame number of miles ſhe will run in one hour, ſuppoſing her to run with the ſame degree of velocity during that time; and therefore it is the general way to heave the log every hour to know her rate of ſailing: but if the force or direction of the wind vary, and not continue the ſame during the whole hour; or if there has been more ſail ſet, or any ſail handed, that ſo the ſhip has run ſwifter or ſlower in any part of the hour than ſhe did at the time of heaving the log; then there muſt be an allowance made accordingly for it, and this muſt be according to the diſcretion of the artiſt.

7. Sometimes when the ſhip is before the wind, and there is a great ſea ſetting after her, it will bring home the log, and conſequently the ſhip will ſail faſter than is given by the log. In this caſe it is uſual, if there be a very great ſea, to allow one mile in ten, and leſs in proportion, if the ſea be not ſo great. But for the generality, the ſhip's way is really greater than that given by the log; and therefore, in order to have the reckoning rather before than behind the ſhip, (which is the ſafeſt way,) it will be proper to make the ſpace on the log-line between knot and knot to conſiſt of 50 feet inſtead of 51.

8 If the ſpace between knot and knot on the log-line ſhould happen to be too great in proportion to the half-minute glaſs, *viz.* greater than 50 feet, then the diſtance given by the log will be too ſhort; and if that ſpace be too ſmall, then the diſtance run (given by the log) will be too great; therefore to find the true diſtance run in either caſe, having meaſured the diſtance between knot and knot, we have the following proportion, *viz.*

As the true diſtance, 50 feet, is to the meaſured diſtance; ſo are the miles of diſtance given by the log, to the true diſtance in miles that the ſhip has run.

EXAMPLE

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EXAMPLE I. Suppoſe a ſhip runs at the rate of $6\frac{3}{4}$ knots in half a minute; but meaſuring the ſpace between knot and knot, I find it to be 56 feet: Required the true diſtance in miles.

Making it, As 50 feet is to 56 feet, ſo is 6.25 knots to 7 knots; I find that the true rate of ſailing is 7 miles in the hour.

EXAMPLE II. Suppoſe a ſhip runs at the rate of $6\frac{3}{4}$ knots in half a minute; but meaſuring the ſpace between knot and knot, I find it to be only 44 feet: Required the true rate of ſailing.

Making it, As 50 feet is to 44 feet, ſo is 6.5 knots to 5.72 knots; I find that the true rate or ſailing is 5.72 miles in the hour.

9. Again, ſuppoſing the diſtance between knot and knot on the log-line to be exactly 50 feet, but that the glaſs is not 30 ſeconds; then, if the glaſs require longer time to run than 30 ſeconds, the diſtance given will be too great, if eſtimated by allowing 1 mile for every knot run in the time the glaſs runs; and, on the contrary, if the glaſs requires leſs time to run them 30 ſeconds, it will give the diſtance ſailed too ſmall. Conſequently, to find the true diſtance in either caſe, we muſt meaſure the time the glaſs requires to run out (by the method in the following article,) then we have the following proportion, *viz.*

As the number of ſeconds the glaſs runs, is to half a minute, or 30 ſeconds; ſo is the diſtance given by the log, to the true diſtance.

EXAMPLE I. Suppoſe a ſhip runs at the rate of $7\frac{1}{2}$ knots in the time the glaſs runs; but meaſuring the glaſs, I find it runs 34 ſeconds: Required the true diſtance ſailed.

Making it, As 34 ſeconds is to 30 ſeconds, ſo is 7.5 to 6.6; I find that the ſhip ſails at the rate of 6.6 miles an hour.

EXAMPLE II. Suppoſe a ſhip runs at the rate of $6\frac{1}{4}$ knots; but meaſuring the glaſs, I find it runs only 25 ſeconds: Required the true rate of ſailing.

Making it, As 25 ſeconds is to 30 ſeconds, ſo is 6.5 knots to 7.8 knots; I find that the true rate of ſailing is 7.8 miles an hour.

10. In order to know how many ſeconds the glaſs runs, you may try it by a watch or clock, that vibrates ſeconds; but if neither of theſe be at hand, then take a line, and to the one end faſtening a plummet, hang the other upon a nail or peg, ſo as the diſtance from the peg to the centre of the plummet be $39\frac{1}{6}$ inches: Then this put into motion will vibrate ſeconds; *i. e.* every time it paſſes the perpendicular, you are to count one ſecond; conſequently, by obſerving the number of vibrations that it makes during the time the glaſs is running, we know how many ſeconds the glaſs runs.

11. If there be an error both in the log line and half-minute glaſs, *viz.* if the diſtance between knot and knot and the log-line be either greater or leſs than 50 feet, and the glaſs runs either more or leſs than 30 ſeconds; then the finding out the ſhip's true diſtance will be ſomewhat more complicate, and admit of three caſes, *viz.*

CASE I. If the glaſs runs more than 30 ſeconds, and the diſtance between knot and knot be leſs than 50 feet, then the diſtance give by the log-line, *viz.* by allowing 1 mile for each knot the ſhip ſails while the glaſs is running, will always be greater than the true diſtance, ſince either of theſe errors give the diſtance too great. Conſequently, to find the true rate of ſailing in this caſe, we muſt firſt find (by Art. 8.) the diſtance, on the ſuppoſition that the log-line is only wrong; and then with this (by Art. 9) we ſhall find the true diſtance.

EXAMPLE. Suppoſe a ſhip is found to run at the rate of 6 knots; but examining the glaſs, I find it runs 35 ſeconds; and meaſuring the log-line, I find the diſtance between knot and knot to be but 46 feet: Required the true diſtance run.

Firſt, (by Art. 8.) We have the following proportion, *viz.* As 50 feet: 46 feet :: 6 knots: 5.52 knots. Then (by Art. 9.) As 35 ſeconds: 30 ſeconds :: 5.52 knots: 4.73 knots. Conſequently the true rate of ſailing is 4.73 miles an hour.

CASE II. If the glaſs be leſs than 30 ſeconds, and the place between knot and knot be more than 50 feet; then the diſtance given by the log will always be leſs than the true diſtance, ſince either of theſe errors leſſen the true diſtance.

EXAMPLE. Suppoſe a ſhip is found to run at the rate of 7 knots; but examining the glaſs, I find it runs only 25 ſeconds; and meaſuring the ſpace between knot an knot on the log line, I find it is 54 feet: Required the true rate of ſailing.

Firſt, (by Art. 9.) As 25 ſeconds: 30 ſeconds :: 7 knots: 8.4 knots. Then (by Art. 8.) As 50 feet: 54 feet :: 8.4 knots: 9.072 knots. Conſequently the true rate of ſailing is 9.072 miles an hour.

CASE III. If the glaſs runs more than 30 ſeconds, and the ſpace between knot and knot be greater than 50 feet; or if the glaſs runs leſs than 30 ſeconds, and the ſpace between knot and knot be leſs than 50 feet: then, ſince in either of theſe two caſes the effects of the errors are contrary, it is plain the diſtance will ſometimes be too great, and ſometimes too little, according as the greater quantity of the error lies; as will be evident from the following examples.

EXAMPLE I. Suppoſe a ſhip is found to run at the rate of $9\frac{1}{2}$ knots per glaſs; but examining the glaſs, it is found to run 36 ſeconds; and by meaſuring the ſpace between knot and knot, it is found to be 58 feet: Required the true rate of ſailing.

Firſt, (by Art. 8.) As 50 feet : 58 feet :: 9.5 knots : 11.02 knots. Then (by Art. 9.) As 38 ſeconds : 30 ſeconds :: 11.02 knots : 8.7 knots. Conſequently the ſhip's true rate of ſailing is 8.7 miles an hour.

EXAMPLE II. Suppoſe a ſhip runs at the rate of 6 knots per glaſs; but examining the glaſs, it is found to run only 20 ſeconds; and by meaſuring the log-line, the diſtance between knot and knot is found to be but 38 feet: Required the true rate of ſailing.

Firſt, (by Art. 8) As 50 feet : 38 feet :: 6 knots : 4.56 knots. Then (by Art 9.) As 20 ſeconds : 30 ſeconds :: 4.56 knots : 6 84 knots. Conſequently the true rate of ſailing is 6.83 miles an hour.

But if in this caſe it happen, that the time the glaſs takes to run be to the diſtance between knot and knot, as 30, the ſeconds in half a minute, is to 50, the true diſtance

diſtance between knot and knot; then it is plain, that whatever number of ſeconds the glaſs conſiſts of, and whatever number of feet is contained between knot and knot; yet the diſtance given by the log-line, will be the true diſtance in miles.

12. Though the method of meaſuring the ſhip's way by the log-line, deſcribed in the foregoing articles, be that which is now commonly made uſe of; yet it is ſubject to ſeveral errors, and theſe very conſiderable. For firſt, the half-minute or quarter-minute-glaſſes (by which, and the log, the ſhip's way is determined) are ſeldom or never true, becauſe dry and wet weather have a great influence on them; ſo that at one time they may run more, and at another time fewer than 30 ſeconds, and it is evident that a ſmall error in the glaſs will cauſe a ſenſible one in the ſhip's way. Again, the chief property of the log is to have it ſwim upright, or perpendicular to the horizon: but this is too often wanting in logs, becauſe few ſeamen examine whether it is ſo or not, and generally take it upon truſt, being ſatisfied if it weigh a little more at the ſtern than the head: and from this there flows an error in the reckoning; for if the log does not ſwim upright, it will not hold water, nor remain ſteady in the place where it is heaved, ſince the leaſt check in the hand in veering the line will make it come up ſeveral feet: this repeated will make the errors become fathoms, and perhaps knots, which, how inſignificant ſoever they appear, are miles and parts of miles, and amount to a good deal in a long voyage. Another inconvenience attending the log-line is its ſtretching and ſhrinking; for when a new line is firſt uſed, let it be ever ſo well ſtretched upon the deck, and meaſured as true as poſſible, yet after wetting it ſhrinks conſiderably; and conſequently to be the better aſſured of the ſhip's way by the log-line, we ought to meaſure and alter the knots on it every time before we uſe it; but this is ſeldom done oftner than once a week, and ſometimes not above once or twice in a whole voyage; alſo when the line is meaſured to its greateſt degree of ſhrinking, it is generally left there; and when, by much uſe, it comes to ſtretch again, it is ſeldom or never mended, though it will ſtretch beyond what it firſt ſhrunk. Theſe, and many other errors, too well known, attending that method of meaſuring the ſhip's way by the log-line, plainly anſwers for a great many errors committed in reckonings. So it is to be wiſhed, that either this method were improved or amended, or that ſome other method leſs ſubject to error were found out.

13. The meridian and prime vertical of any place cuts the horizon in 4 points, at 90 degrees diſtance from one another, *viz.* *North*, *South*, *Eaſt*, and *Weſt*; that part of the *meridian* which extends itſelf from the place to the *north* point of the *horizon* is called the *north line*; that which tends to the *ſouth* point of the horizon, is called the *ſouth line*; and that part of the *prime vertical* which extends towards the right hand of the obſerver, when his face is turned to the *north*, is called the *eaſt line*; and laſtly, that part of the *prime vertical* which tends towards the left hand, is called the *weſt line*; the four points in which theſe lines meet the *horizon*, are called the *cardinal points*.

14. In order to determine the courſe of the winds, and to diſcover their various alterations or ſhiftings; each quadrant of the horizon intercepted between the meridian and prime vertical, is uſually divided into eight equal parts, and conſequently the whole horizon into thirty-two; and the lines drawn from the place on which the obſerver ſtandeth, to the points of diviſion in his horizon, are called rumb lines, the four principal of which are thoſe deſcribed in the preceding article, each of them having its name from the cardinal point in the horizon towards which it tends; the reſt of the rumb lines have their names comounded of the principal lines on each ſide of them, as in the figure; (*ſee Navigation Plates*, No. 1.) and over which-ſoever of theſe lines the courſe of the wind is directed, that wind takes its name accordingly.

15. The inſtrument commonly uſed at ſea for directing the ſhip's way, is called the mariner's compaſs; which conſiſts of a card and two boxes. The card is a circle made to repreſent the horizon, whoſe circumference is quartered and divided into degrees, and alſo into thirty-two equal parts, by lines drawn from the centre to the ſeveral points of diviſion, called points of the compaſs. On the back ſide of the card, and juſt below the ſouth and north line, is fixed a ſteel needle with a braſs cupola, or hollow center in the middle, which is placed upon the end of a fine pin, upon which the card may eaſily turn about; the needle is touched with a load-ſtone, by which a certain virtue is infuſed into it, that makes it (and conſequently the ſouth and north line on the card above it) hang nearly in the plane of the meridian, by which means the ſouth and north lines on the card produced would meet the horizon in the ſouth and north points; and conſequently all the other lines on the card produced would meet the horizon in the reſpective points.

16. The card is repreſented in No. 1. in which you may obſerve, that the capital letters N. S, E, W, denote the four cardinal points, *viz.* N the *North*, S the *South*, &c. and the ſmall letter *b* ſignifies the word *by*: the *Rhombs* in the middle between any two of the cardinals are expreſſed by the letters denoting theſe cardinals, that which denotes the point lying in the meridian having the precedence; thus the rhomb in the middle between the north and eaſt is expreſſed N E. which is to be read *North-Eaſt*; alſo S W denotes the *South-Weſt* rhomb, *&c.* the other rhombs are expreſſed according to their ſituation with reſpect to theſe middle rhombs, and the neareſt cardinals, as is plain from the foreſaid figure.

17. The card is put into a round box, made for it, having a pin erected in the middle, upon which the hollow centre of the needle is fixed, ſo as the card may lie horizontal, and eaſily vibrate according to the motion of the needle: the box is covered over with a ſmooth glaſs, and is hung in a braſs hoop upon two cylindrical pins, diametrically oppoſite to one another; and this hoop is hung within another braſs circle, upon two pins at right angles with the former. Theſe two circles, and the box, are placed in another ſquare wooden box, ſo that the innermoſt box, and conſequently the card, may keep horizontal which way ſoever the ſhip heels.

18. Since the meridians do all meet at the poles, and there

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there form certain angles with one another; and ſince, if we move never ſo little towards the eaſt or weſt, from one place to another, we thereby change our meridian, and in every place the eaſt and weſt line being perpendicular to the meridian; it follows, that the eaſt and weſt line in the firſt place will not coincide with the eaſt and weſt line in the ſecond, but be inclined to it at a certain angle: and conſequently all the other rhomb lines at each place will be inclined to each other, they always forming the ſame angles with the meridian. Hence it follows, that all rhombs, except the four cardinals, muſt be curves or heliſpherical lines, always tending towards the pole, and approaching it by infinite gyrations or turnings, but never falling into it. Thus let P (No. 2.) be the pole, EQ an arch of the equator, PE PA, *&c.* meridians, and EFGHKL any rhomb: then becauſe the angles PEF, PFG, *&c.* are by the nature of the rumb line equal, it is evident that it will form a curve line on the ſurface of the globe, always approaching the pole P, but never falling into it; for if it were poſſible for it to fall into the pole, then it would follow, that the ſame line could cut an infinite number of other lines at equal angles, in the ſame point; which is abſurd.

19. Becauſe there are 32 rumbs (or points in the compaſs) equally diſtant from one another, therefore the angle contained between any two of them adjacent will be 11° 15′, *viz.* $\frac{1}{32}$ part of 360°; and ſo the angle contained between the meridian and the NbE, will be 11° 15′, and between the meridian and the NNE will be 22° 30′; and ſo of the reſt, as in the following table.

A Table of the Angles which every $\frac{1}{4}$ Point of the Compaſs makes with the Meridian.

| South | | |

greater than 45 degrees, and ſo the difference of latitude will be greater than the departure; but if the courſe be greater than 4 points, then the difference of latitude will be leſs than the departure; and laſtly, if the courſe be juſt 4 points, the difference of latitude will be equal to the departure.

5. Since the diſtance, difference of latitude, and departure, form a right-angled triangle, in which the oblique angle oppoſite to the departure is the courſe, and the other its complement; therefore, having any two of theſe given, we can (by plain trigonometry) find the reſt; and hence ariſe the caſes of plain-ſailing, which are as follow.

Case I. Courſe and diſtance given, to find difference of latitude and departure.

Example. Suppoſe a ſhip ſails from the latitude of 30° 25′ north, NNE, 32 miles, (No. 4.) Required the difference of latitude and departure, and the latitude come to. Then (by right angle trigonometry,) we have the following analogy, for finding the departure, *viz.*

As radius	—	—	10.00000
to the diſtance AC	— 32 —	—	1.50515
ſo is the ſine of the courſe A 22° 30′	—	—	9.58284
to the departure BC	— 12.25 —		1.08799

ſo the ſhip has made 12.25 miles of departure eaſterly, or has got ſo far to the eaſtward of her meridian. Then for the difference of latitude or northing the ſhip has made, we have (by rectangular trigonometry) the following analogy, *viz.*

As radius	—	—	10.00000
is to the diſtance AC	— 32 —		1.50515
ſo is the co-ſine of courſe A	— 22° 30′ —		9.96562
to the difference of lat. AB	— 29.57 —		1.47077

ſo the ſhip has differed her latitude, or made of northing, 29.57 minutes.

And ſince her former latitude was north, and her difference of latitude alſo north; therefore,

To the latitude ſailed from	—	30°, 25′ N
add the difference of latitude	—	00°, 29 57
and the ſum is the latitude come to		30°, 54.57 N

By this caſe are calculated the tables of difference of latitude, and departure, to every degree, point, and quarter-point of the compaſs.

Case II. Courſe and difference of latitude given, to find diſtance and departure.

Example. Suppoſe a ſhip, in the latitude of 45° 25′ north, ſails NE½N ½ eaſterly (No 5.) till ſhe come to the latitude of 46° 55′ north. Required the diſtance and departure made good upon that courſe.

Since both latitudes are northerly, and the courſe alſo northerly; therefore,

From the latitude come to	—	46°, 55′
ſubtract the latitude ſailed from	—	45°, 25′
and their remains	—	01°, 30′

the difference of latitude, equal to 90 miles.

And (by rectangular trigonometry) we have the following analogy, for finding the departure BD, *viz.*

As radius	—	—	10.00000
is to the diff. of latitude AB	— 90 —		1.95424
ſo is the tangent of courſe A	— 39°, 22′		9 91404
to the departure BD	— — 73 84		1.86828

ſo the ſhip has got 73 84 miles to the eaſtward of her former meridian.

Again, for the diſtance AD, we have (by rectangular trigonometry) the following proportion, *viz.*

As radius	—	—	10.00000
is to the ſecant of the courſe	39°, 22′		10.11176
ſo is the difference of latitude AB	90 —		1.95424
to the diſtance AD	— — 116.4		2.06600

Case III. Difference of latitude and diſtance given, to find courſe and departure.

Example. Suppoſe a ſhip ſails from the latitude of 56° 50′ north, on a rhomb between ſouth and weſt, 126 miles, and ſhe is then found by obſervation to be in the latitude of 55° 40′ north. Required the courſe ſhe ſailed on, and her departure from the meridian. No 6.

Since the latitudes are both north, and the ſhip ſailing towards the equator; therefore,

From the latitude ſailed from	— —	56° 50′
ſubtract the obſerved latitude	— —	55° 10′
and the remainder	— — —	01°, 40′

equal to 70 miles, is the difference of latitude.

By rectangular trigonometry we have the following proportion for finding the angle of the courſe F, *viz.*

As the diſtance ſailed DF	— 126 —		2.10037
is to radius	— — —		10.00000
ſo is the diff. of latitude FD	70 —		1.84510
to the co-ſine of the courſe F	56°, 15′		9.74473

which, becauſe ſhe ſails between ſouth and weſt, will be ſouth 56° 15′ weſt, or SW½W. Then, for the departure, we have (by rectangulal trigonometry) the following proportion, *viz.*

As radius	—	—	10.00000
is to the diſtance ſailed DF	— 126 —		2.10037
ſo is the ſine of the courſe F	— 56°, 15′		9 91985
to the departure DE	— — 104 8 —		2.02022

conſequently ſhe has made 104.8 miles of departure weſterly.

Case IV. Difference of latitude and departure given, to find courſe and diſtance.

Example. Suppoſe a ſhip ſails from the latitude of 44° 50′ north, between ſouth and eaſt, till ſhe has made 64 miles of eaſting, and is then found by obſervation to be in the latitude of 42° 56′ north. Required the courſe and diſtance made good.

Since the latitudes are both north, and the ſhip ſailing towards the equator; therefore,

From the latitude ſailed from	— —	44°, 50′N
take the latitude come to	— —	42°, 56′
and their remains	— — —	01°, 54′

equal to 114 miles, the difference of latitude or ſouthing.

In this caſe by (rectangular trigonometry) we have the following proportion to find the courſe KGL (No. 7.) *viz.*

As the diff. of latitude GK	114 —		2.05690
is to radius	— — —		10.00000
ſo is the departure KL	— 64 —		1.80618

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to the trangent of courſe G — 29°, 19′ — 9.74928
which, becauſe the ſhip is ſailing between ſouth and eaſt, will be ſouth 29° 19′ eaſt, or SSE ½ eaſt nearly.

Then for the diſtance, we ſhall have (by rectangular trigonometry) the following analogy, *viz.*

As radius — — — — 10.00000
is to the diff. of latitude GK 114 — 2.05690
ſo is the ſecant of the courſe — 29°, 19′ 10.05952
to the diſtance GL — — 130.8 — 2.11642

conſequently the ſhip has ſailed on a SSE ½ eaſt courſe 130.8 miles.

CASE V. Diſtance and departure given, to find courſe and difference of latitude.

EXAMPLE. Suppoſe a ſhip at ſea ſails from the latitude of 34° 24′ north, between north and weſt 124 miles, and is found to have made of weſting 86 miles. Required the courſe ſteered, and the difference of latitude or northing made good.

In this caſe (by rectangular trigonometry) we have the following proportion for finding the courſe ADB, (No. 8.) *viz.*

As the diſtance AD — 124 — 2.09342
is to radius — — — — 10.00000
ſo is the departure AB — 86 — 1.93450
to the ſine of the courſe D 43°, 54′ — 9.84108

ſo the ſhip's courſe is north 33° 54′ weſt, or NW*b*N ¼ weſt nearly.

Then for the difference of latitude, we have (by rectangular trigonometry) the following analogy, *viz.*

As radius — — — — 10 00000
is to the diſtance AD — 124 — 2.09342
ſo is the co ſine of the courſe 43°, 54′ — 9.85766
to the diff. of latitude BD — 89.35 — 1.95108

which is equal to 1 degree and 29 minutes nearly. Hence, to find the latitude the ſhip is in, ſince both latitudes are north, and the ſhip ſailing from the equator; therefore,

To the latitude ſailed from — — 34°, 24′
add the difference of latitude — — 1°, 29′

the ſum is — — — — 35°, 53

the latitude the ſhip is in north.

CASE VI. Courſe and departure given, to find diſtance and difference of latitude.

EXAMPLE. Suppoſe a ſhip at ſea, in the latitude of 24° 30′ ſouth, ſails SE*b*S, till ſhe has made of eaſting 96 miles. Required the diſtance and difference of latitude made good on that courſe.

In this caſe, by *Rectangular Trigonometry*, and by Caſe 2. we have the following proportion for finding the diſtance, (No 9.) *viz.*

As the ſine of the courſe G 33°, 45′ — 9.74474
is to the departure HM — 96 — 1.98227
ſo is radius — — — — 10.00000
to the diſtance GM — 172.8 — 2.23753

Then, for the difference of latitude, we have (by rectangular trigonometry) the following analogy, *viz.*

As the tangent of courſe — 33°, 45′ — 9.82489
is to the departure HM — 96 — — 1 98227
ſo is radius — — — — 10.00000
ſo the difference of latitude GH — 143.7 — 2.15738

equal to 2°, 24′ nearly. Conſequently, ſince the latitude the ſhip ſailed from was ſouth, and ſhe ſailing ſtill towards the ſouth,

To the latitude ſailed from — — 24°, 30′
add the difference of latitude — — — 2°, 24′

and the ſum — — — — 26°, 54

is the latitude ſhe is come to ſouth.

6. When a ſhip ſteers ſeveral courſes in 24 hours, then the reducing all theſe into one, and thereby finding the courſe and diſtance made good upon the whole, is commonly called the reſolving of a traverſe.

7. At ſea they commonly begin each day's reckoning from the noon of that day, and from that time they ſet down all the different courſes and diſtances ſtemmed by the ſhip till noon next day upon the log-board; then from theſe ſeveral courſes and diſtances had from the compaſs and log-line, they compute the difference of latitude and departure for each courſe (by *Caſe* 1. *of Plain Sailing*;) and theſe, together with the courſes and diſtances, are ſet down in a table called the traverſe table, which conſiſts of five columns: in the firſt of which are placed the courſes and diſtances; in the two next the differences of latitude belonging to theſe courſes, according as they are north or ſouth; and in the two laſt are placed the departures belonging to theſe courſes, according as they are eaſt or weſt. Then they ſum up all the northings, and all the ſouthings; and taking the difference of theſe, they know the difference of latitude made good by the ſhip in the laſt 24 hours, which will be north or ſouth, according as the ſum of the northings or ſouthings is greateſt: The ſame way, by taking the ſum of all the eaſtings, and likewiſe of all the weſtings, and ſubtracting the leſſer of theſe from the greater, the difference will be the departure made good by the ſhip laſt 24 hours, which will be eaſt or weſt according as the ſum of the eaſtings is greater or leſs than the ſum of the weſtings; then from the difference of latitude and departure made good by the ſhip laſt 24 hours, found as above, they find the true courſe and diſtance made good upon the whole (by *Caſe* 4. *of Plain Sailing*), as alſo the courſe and diſtance to the intended port.

EXAMPLE. Suppoſe a ſhip at ſea, in the latitude of 48° 24′ north at noon any day, is bound to a port in the latitude of 43° 40′ north, whoſe departure from the ſhip is 144 miles eaſt; conſequently the direct courſe and diſtance of the ſhip is SSE ½ eaſt 315 miles; but by reaſon of the ſhifting of the winds ſhe is obliged to ſteer the following courſes till noon next day, *viz.* SE*b*S 56 miles, SSE 64 miles, NW*b*W 48 miles, S*b*W ½ weſt 54 miles, and SE*b*S ½ eaſt 74 miles. Required the courſe and diſtance made good the laſt 24 hours, and the bearing and diſtance of the ſhip from the intended port.

The ſolution of this traverſe depends entirely on the 1ſt and 4th *caſes of Plain Sailing*; and firſt we muſt (by *Caſe* 1.) find the difference of latitude and departure for each courſe. Thus,

1 Courſe SE*b*S diſtance 56 miles.
For departure.

As radius — — — — 10.00000
is to the diſtance — 56 — 1.74819

ſo

So is the fine of the courſe 33°, 45′ — 9.74474
to the departure — 31.11 — 1.49293

For difference of latitude.

As radius — — — — 10.00000
is to the diſtance — 56 — 1.74819
ſo is the co fine of the courſe 33°, 45′ — 9.91985
to the diff. of latitude — 46.57 — 1.66804

2. Courſe SSE and diſtance 64 miles.

For departure.

As radius — — — 10.00000
is to the diſtance — 64 — 1.80618
ſo is the fine of the courſe 22°, 30′ — 9.58284
to the departure — 24.5 — 1.38902

For difference of latitude.

As radius — — — 10.00000
is to the diſtance — 64 — 1.80618
ſo is the co-fine of the courſe 22°, 30′ — 9.96562
to the difference of latitude 59.13 — 1.77180

3. Courſe NW*b*W and diſtance 48 miles.

For departure.

As radius — — — 10.00000
is to the diſtance — 48 — 1.68124
ſo is the fine of the courſe 56°, 15′ — 9.91985
to the departure — 39.91 — 1.60109

For difference of latitude.

As radius — — — 10.00000
is to the diſtance — 48 — 1.68124
ſo is the co-fine of the courſe 56°, 15′ — 9.74474
to the difference of latitude 26.67 — 1.42598

4. Courſe S*b*W ¼ weſt and diſtance 54 miles.

For departure.

As radius — — — 10.00000
is to the diſtance — 54 — 1.73239
ſo is the fine of the courſe 16°, 52′ — 9.46262
to the departure — 15.67 — 8.19501

For difference of latitude.

As radius — — — 10.00000
is to the diſtance — 54 — 1 73239
ſo is the co-fine of the courſe 16°, 52′ — 9.98090
to the difference of latitude 51.67 — 1.71329

5. Courſe SE*b*S ¼ eaſt and diſtance 74 miles.

For departure.

As radius — — — 10.00000
is to the diſtance — 74 — 1.86923
ſo is the fine of the courſe 39°, 22′ — 9 80228
to the departure — 46.94 — 1.67151

For difference of latitude.

As radius — — — 10.00000
is to the diſtance — 74 — 1:80923
ſo is the co-fine of the courſe 39°, 22′ — 9.88824
to the difference of latitude 57.21 — 1.75747

Now theſe ſeveral courſes and diſtances, together with the differences of latitude and departures deduced from them, being ſet down in their proper columns in the traverſe table, will ſtand as on next column.

From that table it is plain, ſince the ſum of the northings is 26.67, and of the ſouthings 214.58, the difference between theſe, *viz.* 187 91. will be the ſouthing made good by the ſhip the laſt 24 hours; alſo the ſum of the eaſtings being 102.55, and of the weſtings 55.58, the difference 46 97 will be the eaſting or departure made good by the ſhip's

The TRAVERSE TABLE.

Courſes	Diſtances	Diff. of Lat. N	Diff. of Lat. S	Departure E	Departure W
SE*b*S —	56	—	46 57	31.11	—
SSE —	64	—	59.13	24.5	—
NW*b*W —	48	26.67	—	—	39.91
S*b*W ¼ Weſt —	54	—	51.67	—	15.67
SE*b*S ¼ Eaſt —	94	—	57.21	46.94	—
		26.67	214.58	102.55	55.58
			26.67	55.58	
		Diff. of Lat.	187 .91	46.97	Dep.

laſt 24 hours; conſequently, to find the true courſe and diſtance made good by the ſhip in that time, it will be, (by *Caſe* 4. *of Plain Sailing*,)

As the difference of latitude — 187.91 2.27393
is to radius — — 10.00000
ſo is the departure — — 46.97 1.67182
to the tangent of the courſe 14°. 03 — 9.39789

which is S*b*E ¼ eaſt nearly. Then for the diſtance, it will be,

As radius — — 10.00000
is to the difference of latitude 187.91 2.27393
ſo is the ſecant of the courſe 14°, 03′ 10.01319
to the diſtance — — 193 7 2.28712

conſequently the ſhip has made good the laſt 24 hours, on a S*b*E ¼ eaſt courſe, 193,7 miles: And ſince the ſhip is ſailing towards the equator; therefore,

From the latitude ſailed from — 48°, 24′ N
take the diff. of latitude made good — 3 , 08 S

there remains — — 45 , 16 N

the latitude the ſhip is in north. And becauſe the port the ſhip is bound for lies in the latitude of 43° 40′ north, and conſequently ſouth of the ſhip; therefore,

From the latitude the ſhip is in — 45°, 16′ N
take the latitude ſhe is bound for — 43 , 40 N

and there remains — — 1 , 36

or 96 miles, the difference of latitude or ſouthing the ſhip has to make. Again, the whole eaſting the ſhip had to make being 144 miles, and ſhe having already made 46.97 or 47 miles of eaſting; therefore the departure or eaſting ſhe ſtill has to make will be 97 miles: conſequently, to find the direct courſe and diſtance between the ſhip and the intended port, it will be (by *Caſe* 4. *of Plain Sailing*)

As the difference of latitude — 96 — 1.98227
is to radius — — 10.00000
ſo is the departure — 97 — 1.98677
to the tangent of the courſe — 45°, 19′ 10.00450

And

As radius — — 10.00000
is to the difference of latitude 96 — 1.98227
ſo is the ſecant of the courſe 45°, 19′ — 10.15293
to the diſtance — 136.5 — 2.13620

whence the true bearing and diſtance of the intended port is SE, 136.5 miles.

Sect. 3. *Of* Parallel Sailing.

1. Since the parallels of latitude do always decreaſe the nearer they approach the pole, it is plain a degree on any of them muſt be leſs than a degree upon the equator. Now in order to know the length of a degree on any of them, let PB (No. 10.) repreſent half the earth's axis, PA a quadrant of a meridian, and conſequently A a point on the equator, C a point on the meridian, and CD a perpendicular from that point upon the axis, which plainly will be the ſine of CP the diſtance of that point from the pole, or the co ſine of CA its diſtance from the equator; and CD will be to AB, as the ſine of CP, or co-ſine of CA, is to the radius. Again, if the quadrant PAB is turned round upon the axis PB, it is plain the point A will deſcribe the circumference of the equator whoſe radius is AB, and any other point C upon the meridian will deſcribe the circumference of a parallel whoſe radius is CD.

Cor. I. Hence (becauſe the circumference of circles are as their radii) it follows, that the circumference of any parallel is to the circumference of the equator, as the co ſine of its latitude is to radius.

Cor. II. And ſince the wholes are as their ſimilar parts, it will be, As the length of a degree on any parallel is to the length of a degree upon the equator, ſo is the co ſine of the latitude of that parallel to radius.

Cor. III. Hence, as radius is to the co-ſine of any latitude, ſo are the minutes of difference of longitude between two meridians, or their diſtance in miles upon the equator, to the diſtance of theſe two meridians on the parallel in miles.

Cor. IV. And as the co-ſine of any parallel is to radius, ſo is the length of any arch on that parallel (intercepted between two meridians) in miles, to the length of a ſimilar arch on the equator, or minutes of difference of longitude.

Cor. V. Alſo, as the co-ſine of any one parallel is to the co-ſine of any other parallel, ſo is the length of any arch on the firſt, in miles, to the length of the ſame arch on the other in miles.

2. From what has been ſaid, ariſes the ſolution of the ſeveral caſes of parallel ſailing, which are as follow.

Case I. Given the difference of longitude between two places; both lying on the ſame parallel; to find the diſtance between thoſe places.

Example I. Suppoſe a ſhip in the latitude of 54° 20′ north, ſails directly weſt on that parallel till ſhe has differed her longitude 12° 45′; required the diſtance ſailed on that parallel.

Firſt, The difference of longitude reduced into minutes, or nautical miles, is 765′, which is the diſtance between the meridian ſailed from, and the meridian come to, upon the equator; then to find the diſtance between theſe meridians on the parallel of 54° 20′, or the diſtance ſailed, it will be, by *Cor.* 3. of the laſt article,

As radius	— — —	10.00000
is to the co-ſine of the lat.	54°, 20′	9.76572
ſo are the minutes of diff. long.	765	2.88366
to the diſtance on the parallel	446.1	2.64938

Example II. A degree on the equator being 60 minutes or nautical miles; required the length of a degree on the parallel of 51° 32′.

By *Cor.* 3. of the laſt article, it will be

As radius	— — —	10.00000
is to the co-ſine of the latitude	51° 32′	9.79383
ſo are the minutes in 1 degree on the equa.	60	1.77815
to	— — —	37.32 1.57198

the miles anſwering to a degree on the parallel of 51° 32′

By this problem the following table is conſtructed, ſhewing the geographic miles anſwering to a degree on any parallel of latitude; in which you may obſerve, that the columns marked at the top with *D.L.* contain the degrees of latitude belonging to each parallel; and the adjacent columns marked at the top, *Miles*, contain the geographic miles anſwering to a degree upon theſe parallels.

A Table ſhewing how many Miles anſwer to a Degree of Longitude, at every Degree of Latitude.

D.L.	*Miles*	*D.L.*	*Miles*	*D.L.*	*Miles*	*D.L.*	*Miles*	*D.L.*	*Miles*
1	59 99	19	56.73	37	47.92	55	34.41	73	17.54
2	59.97	20	56.38	38	47 28	56	33.55	74	16.53
3	59.92	21	56.01	39	46.62	57	32.68	75	15 52
4	59.86	22	55.63	40	45.95	58	31.75	76	14.51
5	59 77	23	55.23	41	45.28	59	30.90	77	13.50
6	59.67	24	54 81	42	44 95	60	30.00	78	12.48
7	59.56	25	54.38	43	43.88	61	29.09	79	11.45
8	59.42	26	53 93	44	43.16	62	28.17	80	10.42
9	59 26	27	53.46	45	42.43	63	27.24	81	9.38
10	59.08	28	52.97	46	51.68	64	26 30	82	8 35
11	58.89	29	52.47	47	40 92	65	25.36	83	7.32
12	58 68	30	51.96	48	40 15	66	24.41	84	6.28
13	58.46	31	51.43	49	39 36	67	23.45	85	5.23
14	58.22	32	50 88	50	38.57	68	22 48	86	4.18
15	57 95	33	50 32	51	37.76	69	21.50	87	3.14
16	57 67	34	49.74	52	36.94	70	205 2	88	2.09
17	57.37	35	49.15	53	36.11	71	19.54	89	1.05
18	57.06	36	48.54	54	35.26	72	18.55	90	0.00

Though

Though this table does only ſhew the miles anſwering to a degree of any parallel, whoſe latitude conſiſts of a whole number of degrees; yet it may be made to ſerve for any parallel whoſe latitude is ſome number of degrees and minutes, by making the following proportion, *viz.*

As 1 degree, or 60 minutes, is to the difference between the miles anſwering to a degree in the next greater and next leſs tabular latitude than that propoſed; ſo is the exceſs of the propoſed latitude above the next tabular latitude, to a proportional part; which, ſubtracted from the miles anſwering to a degree of longitude in the next leſs tabular latitude, will give the miles anſwering to a degree in the propoſed latitude.

EXAMPLE. Required to find the miles anſwering to a degree on the parallel of 56° 44′.

Firſt, The next leſs parallel of latitude in the table than that propoſed, is that of 56°, a degree of which (by the table) is equal to 33.55 miles; and the next greater parallel of latitude in the table, than that propoſed, is that of 57°, a degree of which is (by the table) equal to 32 68 miles; the difference of theſe is 87, and the diſtance between theſe parallels is 1 degree or 60 minutes; alſo the diſtance between the parallel of 56°, and the propoſed parallel of 56° 44′, is 44 minutes: then by the preceding proportion it will be, As 60 is to 87, ſo is 44 to 638, the difference between a degree on the parallel of 56° and a degree on the parallel of 56° 44′; which therefore taken from 33.55, the miles anſwering to a degree on the parallel of 56°, leaves 32.912, the miles anſwering to a degree on the parallel of 56° 44′, as was required.

CASE II. The diſtance ſailed in any parallel of latitude, or the diſtance between any two places on that parallel, being given; to find the difference of longitude.

EXAMPLE. Suppoſe a ſhip in the latitude of 55° 36′ north ſails directly eaſt 685 6 miles; required how much ſhe has differed her longitude.

By Cor. 4. Art. 1. of this ſection, it will be

As the co ſine of the lat.	——	55° 36′	—— 9.75202
is to radius	——	——	—— 10.00000
ſo is the diſtance ſailed	——	685 6	—— 2 83607
to min. of diff. of long.	——	1213	—— 3.08405

which reduced into degrees, by dividing by 60, makes 20° 13′, the difference of longitude the ſhip has made.

This may alſo be ſolved by help of the foregoing table, *viz.* by finding from it the miles anſwering to a degree on the propoſed parallel, and dividing with this the given number of miles, the quotient will be the degrees and minutes of difference of longitude required.

Thus in the laſt example; I find, from the foregoing table, that a degree on the parallel of 55° 36′ is equal to 33 89 miles; by this I divide the propoſed number of miles 685.6 and the quotient is 20.13 degrees, *i. e.* 20° 13′, the difference of longitude required.

CASE III. The difference of longitude between two places on the ſame parallel, and the diſtance between them, being given; to find the latitude of that parallel.

EXAMPLE. Suppoſe a ſhip ſails on a certain parallel directly weſt 624 miles, and then has differed her longitude 18° 46′ or 1126 miles: Required the latitude of the parallel ſhe ſailed upon.

By Cor. 3. Art. 1. of this ſection, it will be,

As the min. of diff. long.	—	1126	— 3.05154
is to the diſtance ſailed	—	624	— 2.79518
ſo is radius	—	—	— 10.00000
to the co ſine of the lat.		56° 21′	— 9.74364

conſequently the latitude of the ſhip or parallel ſhe ſailed upon was 56° 21′.

From what has been ſaid, may be ſolved the following problems.

PROB. I. Suppoſe two ſhips in the latitude of 46° 30′ north, diſtant aſunder 654 miles, ſail both directly north 256 miles, and conſequently are come to the latitude of 50° 46′ north: Required their diſtance on that parallel

By Cor. 6. Art. 1. of this Section, it will be,

As the co ſine of	—	46° 30′	— 9.83781
is to the co-ſine of	—	50° 46′	— 9.80105
ſo is	—	654	— 2.81558
to	—	601	— 2.77882

the diſtance between the ſhips when on the parallel of 50° 46′.

PROB. II. Suppoſe two ſhips in the latitude of 45° 48′ north, diſtant 846 miles, ſail directly north till the diſtance between them is 624 miles: Required the latitude come to, and the diſtance ſailed.

By Cor. 5. Art. 1. of this Section, it will be,

As their firſt diſtance	—	846	— 2.92737
is to their ſecond diſtance	—	624	— 2.79518
ſo is the co-ſine of	—	45° 48′	— 9.84334
to the co-ſine	—	59 , 04	— 9.71115

the latitude of the parallel the ſhips are come to.

Conſequently to find their diſtance ſailed,

From the latitude come to	—	59°, 04′
ſubtract the latitude ſailed from,	—	45 , 48
and there remains	—	13 , 16

equal to 796 miles, the difference of latitude or diſtance ſailed.

Sect. 4. *Of* MIDDLE-LATITUDE SAILING.

WHEN two places lie both on the ſame parallel, we ſhewed in the laſt ſection, how, from the difference of longitude given, to find the miles of eaſting or weſting between them, & *e contra*. But when two places lie not on the ſame parallel, then their difference of longitude cannot be reduced to miles of eaſting or weſting on the parallel of either place: for if counted on the parallel of that place that has the greateſt latitude, it would be too ſmall; and if on the parallel of that place having the leaſt latitude, it would be too great. Hence the common way of reducing the difference of longitude between two places, lying on different parallels, to miles of eaſting or weſting, & *e contra*, is by counting it on the middle parallel between the places, which is found by adding the latitudes of the two places together, and taking half the ſum, which will be the latitude of the middle parallel required. And hence ariſes the ſolution of the following caſes.

CASE I. The latitudes of two places, and their difference of longitude, given; to find the direct courſe and diſtance.

EXAMPLE.

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EXAMPLE. Required the direct course and distance between the Lizard in the latitude of 50° 00′ north, and longitude of 5° 14′ west, and St Vincent in the latitude of 17° 10′ N. and longitude of 24 20 W.

First, To the latitude of the Lizard	—	50°, 00′ N.
add the latitude of St Vincent	—	17 , 10
The sum is	—	67 , 10
Half the sum or latitude of the middle parallel is	—	33 , 35 N.
Also the difference of latitude is	—	33 , 50

equal to 1970 miles of southing. Again,

From the longitude of St Vincent	—	24 , 20 W.
take the longitude of the Lizard	—	05 , 14
there remains	—	16 , 06

equal to 1146 min. of diff. of long. west.

Then for the miles of westing, or departure, it will be, by *Case* 1. *of Parallel Sailing*,

As radius	—	—	10.00000
is to the co-sine of the middle parallel	— 33° 35′	—	9.92069
so is min. diff. of long.	— 1146	—	3.05918
to the miles of westing	— 954.7	—	2.97987

And for the course it will be, by *Case* 4. *of Plain Sailing*,

As the diff. of lat.	— 1970	—	3.29447
is to radius	—	—	10.00000
so is the departure	— 954.7	—	2.97987
to the tang. of the course	25°, 51′	—	9.68540

which, because it is between south and west, it will be SSW ¼ west nearly.

For the distance, it will be, by the same case,

As radius	—	—	10.00000
is to the diff. of lat.	— 1970	—	3.29447
so is the secant of the course	25°, 51′		10.04579
to the distance	— 2189	—	3.34026

whence the direct course and distance from the Lizard to St Vincent is SSW ¼ W, 2189 miles.

CASE II. One latitude, course, and distance sailed being given, to find the other latitude and difference of longitude.

EXAMPLE. Suppose a ship in the latitude of 50° 00′ north, sails south 50° 06′ west, 150 miles: Required the latitude the ship has come to, and how much she has differed her longitude.

First, For the difference of latitude, it will be, by *Case* 1. *of Plain Sailing*,

As radius	—	—	10.00000
is to the distance	— 150	—	2.17609
so is the co-sine of the course	50°, 06′		9.80716
to the diff. of latitude	— 96.22	—	1.98325

equal to 1°, 36′. And since the ship is sailing towards the equator; therefore,

From the latitude she was in	—	50°, 00′
take the diff. of latitude	— —	1 , 36
and there remains	— —	48 , 24

the latitude she has come to north. Consequently the latitude of the middle parallel will be 49° 12′.

Then for departure or westing it will be, by the same *case*,

As radius	—	—	10.00000
is to the distance	— 150	—	2.17609
so is the sine of the course	50° 06′	—	9 88489
to the departure	— 115.1	—	2.06098

As for the difference of longitude, it will be, by *Case* 2. *of Plain Sailing*.

As the co-sine of the middle parallel	49° 12′		9.81519
is to radius	—	—	10.00000
so is the departure	— 115.1	—	2 06098
to the min. diff. of longitude	176.1	—	2.24579

equal to 2° 56, which is the difference of longitude the ship has made westerly.

CASE III. Course and difference of latitude given; to find the distance sailed, and difference of longitude.

EXAMPLE. Suppose a ship in the latitude of 53° 34′ north, sails SE*b*S, till by observation she is found to be in the latitude of 51° 12′, and consequently has differed her latitude 2° 22′ or 142 miles: Required the distance sailed, and the difference of longitude.

First, for the departure, it will be (by *Case* 2. *of Plain Sailing*,)

As radius	—	—	10.00000
is to the diff. of latitude	— 142	—	2.15229
so is the tang. of course	— 33° 45′	—	9.82489
to the departure	— 94.88	—	1.97718

And for the distance it will be, by the same *Case*,

As radius	—	—	10.00000
is to the diff. of latitude	— 142	—	2.15229
so is the secant of the course	33° 45′	—	10.08015
to the distance	— 170.8	—	2.23244

Then, since the latitude sailed from was 53° 34′ north, and the latitude come to 51° 12′ north; therefore the middle parrallel will be 52° 23′; and consequently, for the difference of longitude, it will be (by *Case* 2. *of Parallel Sailing*)

As the co-sine of the mid. parallel	52° 23′		9.78560
is to the departure	—	— 94.88	1.97718
so is radius	—	—	10.00000
to min. of diff. of longitude	—	155.5	2.19158

equal to 2° 35′ the difference of longitude easterly.

CASE IV. Difference of latitude and distance sailed, given; to find the course and difference of longitude.

EXAMPLE. Suppose a ship in the latitude of 43° 26′ north, sails between south and east, 246 miles, and then is found by observation to be in the the latitude of 41° 06′ north: Required the direct course and difference of longitude.

First, For the course, it will be, by *Case* 3. *of Plain Sailing*.

As the distance	— 246	—	2.39094
is to radius	—	—	10.00000
so is the diff. of latitude	— 140	—	2.14613
to the co-sine of the course	55° 19′	—	9.75519

which, because the ship sails between south and east, will be south 55° 19′ east, or SE*b*E nearly.

Then for departure, it will be, by the same *Case*,

As radius	—	—	10.00000
is to the distance	— 246	—	2.39094

so

so is the sine of the course 55° 19′ —— 9.91504
to the departure —— 202.3 —— 2 30598

Lastly, For the difference of longitude, it will be, by *Case* 2. of *Parallel Sailing*,

As the co-sine of the mid. par. 42° 16′ —— 9 86924
is to the departure —— 302.3 —— 2.30598
so is radius —— —— —— 10.00000
to min. of diff. of longitude 273.3 —— 2.43674

equal to 4° 33′, the difference of longitude easterly.

Case V. Course and departure given, to find difference of latitude, difference of longitude, and distance sailed.

Example. Suppose a ship in the latitude of 48° 23′ north, sails SW*b*S, till she has made of westing 123 miles: Required the latitude come to, the difference of longitude, and the distance sailed.

First, For the distance, it will be, by *Case* 6. of *Plain Sailing*,

As the sine of the course — 33°, 45′ —— 9.74474
is to the departure —— 123 —— 2.08991
so is radius —— —— —— 10.00000
to the distance —— 221.4 —— 2.34517

And for the difference of latitude it will be, by the same *Case*,

As the tang. of course —— 33°, 45′ —— 9.82489
is to the departure —— 123 —— 2.08991
so is radius —— —— —— 10.00000
to the diff. of latitude —— 184 —— 2.26502

equal to 3° 04′: And since the ship is sailing towards the equator, the latitude come to will be 45° 19′ north; and consequently the middle parallel will be 46° 51′.

Then to find the difference of longitude, it will be, by *Case* 2. of *Parallel Sailing*,

As the co-sine of mid. par. 46°, 51′ —— 9.83500
is to departure —— 123 —— 2.08991
so is radius —— —— —— 10.00000
to min. of diff. of longit. —— 180 —— 2.25491

which is equal to 3° 00′, the difference of longitude westerly.

Case VI. Difference of latitude and departure given, to find course, distance, and difference of longitude.

Example. Suppose a ship in the latitude of 46° 37′ north, sails between south and east, till she has made of easting 146 miles, and is then found by observation to be in the latitude of 43° 24′ north; required the course, distance, and difference of longitude.

First, By *Case* 4. of *Plain Sailing*, it will be for the course,

As the diff of latitude —— 193 —— 2.28556
is to departure —— 146 —— 2.16137
so is radius —— —— —— 10.00000
to the tang. of the course —— 36°, 55′ —— 9.87581

which, because the ship is sailing between south and east, will be south 36° 55′ east, or SE*b*S ¼ east nearly.

For the distance, it will be, by the same *Case*,

As radius —— —— —— 10.00000
is to the diff. of latitude —— 193 —— 2.28556
so is the secant of the course 36°, 55′ —— 10.09718
to the distance —— 241.4 —— 2.38274

Then for the difference of longitude, it will be, by *Case* 2. of *Parallel Sailing*,

As the co-sine of the mid. par. 45°, 00′ 9.84949
is to the departure —— —— 146 —— 2.16137
so is radius —— —— —— 10.00000
to min. of diff. of longitude —— 205 —— 2.31188

equal to 3° 25′, the difference of longitude easterly.

Case VII. Distance and departure given, to find difference of latitude, course, and difference of longitude.

Example. Suppose a ship in the latitude of 33° 40′ north, sails between south and east 165 miles, and has then made of easting 112.5 miles; required the difference of latitude, course, and difference of longitude.

First, For the course, it will be, by *Case* 5. of *Plain Sailing*,

As the distapce — 165 —— 2.21748
is to radius — — — — 10.00000
so is the departure —— 102.5 —— 2.05115
to the sine of the course 42°, 59′ —— 9.83367

which, because the ship sails between south and east, will be south 42° 59′ east or SE*b*E ¼ east nearly.

And for the difference of latitude, it will be, by the same *Case*,

As radius — — — — 10.00000
is to the distance — 165 — 2.21748
so is the co sine of the course 42° 59′ — 9.86436
to the difference of lat. — 120.7 — 2.08184

equal to 2° 00′; consequently the latitude come to will be 31° 40′ north, and the latitude of the middle parallel will be 32° 40′. Hence, to find the difference of longitude, it will be, by *Case* 2. of *Parallel Sailing*,

As the co-sine of the mid. par. 32°, 40′ — 9.92522
is to the departure —— 112.5 —— 2.05115
so is radius — — — — 10.00000
to min. of diff. of long. —— 133.6 — 2.12593

equal to 2° 13′ nearly, the difference of longitude easterly.

Case VIII. Difference of longitude and departure given, to find difference of latitude, course, and distance sailed.

Example. Suppose a ship in the latitude of 50° 46′ north, sails between south and west, till her difference of longitude is 3° 12′, and is then found to have departed from her former meridian 126 miles; required the difference of latitude, course, and distance sailed.

First, For the latitude she has come to, it will be, by *Case* 3. of *Parallel Sailing*,

As min. of diff. of long. —— 192 —— 2.28330
is to departure —— 126 —— 2.10037
so is radius —— —— —— 10.00000
to the co-sine of the mid. par. — 48°, 59′ — 9.81707

Now since the middle latitude is equal to half the sum of the two latitudes (by Art. 1. of this Sect.) and so the sum of the two latitudes equal to double the middle latitude; it follows, that if from double the middle latitude we subtract any one of the latitudes, the remainder will be the other. Hence from twice 48° 59′, *viz.* 97° 58′ taking 50° 46′ the latitude sailed from, there remains 47° 12′ the latitude come to; consequently the difference of latitude is 3° 34′, or 214 minutes.

Then for the course, it will be, by *Case* 4. of *Plain Sailing*,

As diff. of lat. —— 214 —— 2.33041

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is to radius	——	——	10.00000
ſo is the departure	—— 126	——	2.10037
to the tang. of the courſe	30°, 29′	——	9.76996

which, becauſe it is between ſouth and weſt, will be ſouth 30° 29′ weſt, or SSW ½ weſt nearly.

And for the diſtance, it will be, by the ſame *Caſe*,

As radius	— — —	—	10.00000
is to the diff. of lat.	—— 214	——	2.33041
ſo is the ſecant of the courſe	30°, 29′	—	10.06461
to the diſtance	—— 248.4	—	2.39502

2 From what has been ſaid, it will be eaſy to ſolve a traverſe, by the rules of *Middle Latitude Sailing*.

EXAMPLE. Suppoſe a ſhip in the latitude of 43° 25′ north, ſails upon the following courſes, *viz.* SW*b*S 63 miles, SSW½weſt 45 miles, S*b*E 54 miles, and SW*b*W 74 miles: Required the latitude the ſhip has come to, and how far ſhe has differed her longitude.

Firſt, By *Caſe* 2. of this *Sect.* find the difference of latitude and difference of longitude belonging to each courſe and diſtance, and they will ſtand as in the following table.

Courſes	*Diſtances*	*Diff. of Lat.*		*Diff of Longit.*	
		N	*S*	*E*	*W*
SW*b*S	— 63	——	52 4	——	47.85
SSW ½W	— 45	——	39.7	——	28.62
S*b*E	— 54	——	53 0	13.75	——
SW*b*W	— 74	——	41.1	——	81 08
					157.55
	Diff. of Lat.		186.2		13.75
				Diff. of Long.	143.80

Hence it is plain the ſhip has differed her latitude 186.2 minutes, or 3° 6′ and ſo has come to the latitude of 40° 19′ north, and has made of difference of longitude 143.8 minutes, or 2° 23′ 48″ weſterly.

3. This method of ſailing, though it be not ſtrictly true, yet it comes very near the truth, as will be evident, by comparing an example wrought by this method with the ſame wrought by the method delivered in the next *Section*, which is ſtrictly true; and it ſerves, without any conſiderable error, in runnings of 450 miles between the equator and parallel of 30 degrees, of 300 miles between that and the parallel of 60 degrees, and of 150 miles as far as there is any occaſion, and conſequently muſt be ſufficiently exact for 24 hours run.

Sect. 5. *Of* MERCATOR'S SAILING.

1. THOUGH the meridians do all meet at the pole, and the parallels to the equator do continually decreaſe, and that in proportion to the co-ſines of their latitudes; yet in old ſea charts the meridians were drawn parallel to one another, and conſequently the parallels of latitude made equal to the equator, and ſo a degree of longitude on any parallel as large as a degree on the equator: alſo in theſe charts the degrees of latitude were ſtill repreſented (as they are in themſelves) equal to each other, and to thoſe of the equator. By theſe means the degrees of longitude being increaſed beyond their juſt proportion, and the more ſo the nearer they approach the pole, the degrees of latitude at the ſame time remaining the ſame, it is evident places muſt be very erroneouſly marked down upon theſe charts with reſpect to their latitude and longitude, and conſeqnently their bearing from one another very falſe.

2. To remedy this inconvenience, ſo as ſtill to keep the meridians parallel, it is plain we muſt protract, or lengthen, the degrees of latitude in the ſame proportion as thoſe of longitude are, that ſo the proportion in eaſting and weſting may be the ſame with that of ſouthing and northing, and conſequently the bearings of places from one another be the ſame upon the chart as upon the globe itſelf.

Let ABD (No. 11.) be a quadrant of a meridian, A the pole, D a point on the equator, AC half the axis, B any point upon the meridian, from which draw BF perpendicular to AC, and BG perpendicular to CD; then BG will be the ſine, and BF or CG the co-ſine of BD the latitude of the point B; draw D the tangent and CE the ſecant of the arch CD. It has been demonſtrated in Sect. 3. that any arch of a parallel is to the like arch of the equator as the co-ſine of the latitude of that parallel is to radius. Thus any arch as a minute on the parallel deſcribed by the point B, will be to a minute on the equator as BF or CG is to CD; but ſince the triangles CGB CDE are ſimilar, therefore CG will be to CD as CB is to CE, *i. e.* the co-ſine of any parallel is to radius as radius is to the ſecant of the latitude of that parallel. But it has been juſt now ſhown, that the co ſine of any parallel is to radius, as the length of any arch as a minute on that parallel is to the length of the like arch on the equator: Therefore the length of any arch as a minute on any parallel, is to the length of the like arch on the equator, as radius is to the ſecant of the latitude of that parallel; and ſo the length of any arch, as a minute on the equator, is longer than the like arch of any parallel in the ſame proportion, as the ſecant of the latitude of that parallel is to radius. But ſince in this projection the meridians are parallel, and conſequently each parallel of latitude equal to the equator, it is plain the length of any arch as a minute on any parallel, is increaſed beyond its juſt proportion, at ſuch rate as the ſecant of the latitude of that parallel is greater than radius; and therefore to keep up the proportion of northing and ſouthing to that of eaſting and weſting, upon this chart, as it is upon the globe itſelf, the length of a minute upon the meridian at any parallel muſt alſo be increaſed beyond its juſt proportion at the ſame rate, *i. e.* as the ſecant of the latitude of that parallel is greater than radius. Thus to find the length of a minute upon the meridian at the latitude of 75 degrees, ſince a minute of a meridian is every where equal on the globe, and alſo equal to a minute upon the equator, let it be repreſented by unity: then making it as radius is to the ſecant of 75 degrees, ſo is unity to a fourth number, which is 3.864 nearly: and conſequently, by whatever line you repreſent one minute on the equator of this chart, the length of one minute on the enlarged meridian

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meridian at the latitude of 75 degrees, or the diſtance between the parallel of 75° 00′ and the parallel of 75° 01′, will be equal to 3 of theſe lines, and $\frac{864}{1000}$ of one of them. By making the ſame proportion, it will be found, that the length of a minute on the meridian of this chart at the parallel of 60°, or the diſtance between the parallel of 60° 00′ and that of 60° 01′, is equal to two of theſe lines. After the ſame manner, the length of a minute on the enlarged meridian may be found at any latitude; and conſequently beginning at the equator, and computing the length of every intermediate minute between that and any parallel, the ſum of all theſe ſhall be the length of a meridian intercepted between the equator and that parallel; and the diſtance of each degree and minute of latitude from the equator upon the meridian of this chart, computed in minutes of the equator, forms what is commonly called a table of meridional parts.

If the arch BD (No. 11.) repreſent the latitude of any point B, then (CD being radius) CE will be the ſecant of that latitude: but it has been ſhown above, that radius is to the ſecant of any latitude, as the length of a minute upon the equator is to the length of a minute on the meridian of this chart at that latitude; therefore CD is to CE, as the length of a minute on the equator is to the length of a minute upon the meridian, at the latitude of the point B. Conſequently, if the radius CD be taken equal to the length of a minute upon the equator, CE, or the ſecant of the latitude, will be equal to the length of a minute upon the meridian at that latitude. Therefore, in general, if the length of a minute upon the equator be made radius, the length of a minute upon the enlarged meridian will be every where equal to the ſecant of the arch contained between it and the equator.

Cor. 1. Hence it follows, ſince the length of every intermediate minute between the equator and any parallel, is equal to the ſecant of the latitude (the radius being equal to a minute upon the equator) the ſum of all theſe lengths, or the diſtance of that parallel on the enlarged meridian from the equator, will be equal to the ſum of all the ſecants, to every minute contained between it and the equator.

Cor. 2. Conſequently the diſtance between any two parallels on the ſame ſide of the equator is equal to the difference of the ſums of all the ſecant contained between the equator and each parallel, and the diſtance between any two parallels on contrary ſides of the equator is equal to the ſum of the ſums of all the ſecants contained between the equator and each parallel.

5. By the tables of meridional parts, which may be ſeen in Paton, and other writers on this ſubject, may be conſtructed the nautical chart, commonly called Mercator's chart. Thus, for example, let it be required to make a chart that ſhall commence at the equator, and reach to the parallel of 60 degrees, and ſhall contain 80 degrees of longitude.

Draw the line EQ repreſenting the equator, (ſee No. 12.) then take, from any convenient line of equal parts, 4800 (the number of minutes contained in 80 degrees,) which ſet off from E to Q, and this will determine the breadth of the chart.

Divide the line EQ into eight equal parts, in the points 10, 20, 30, &c. each containing 10 degrees, and each of theſe divided into 10 equal parts will give the ſingle degrees upon the equotor; then through the points E, 10, 20, &c. drawing lines perpendicular to EQ, theſe ſhall be meridians.

From the ſcale of equal parts take 4527.4 (the meridional parts anſwering to 60 degrees,) and ſet that off from E to A and from Q to B, and join AB; then this line will repreſent the parallel of 60, and will determine the length of the chart.

Again, from the ſcale of equal parts take 603.1 (the meridional parts anſwering to 10 degrees,) and ſet that off from E to 10 on the line EA; and through the point 10 draw 10, 10, parallel to EQ; and this will be the parallel of 10 degrees. The ſame way, ſetting off from E on the line EA, the meridional parts anſwering to each degree, &c. of latitude, and through the ſeveral points drawing lines parallel to EQ, we ſhall have the ſeveral parallels of latitude.

If the chart does not commence from the equator, but is only to ſerve for a certain diſtance on the meridian between two given parallels on the ſame ſide of the equator; then the meridians are to be drawn as in the laſt example: and for the parallels of latitude you are to proceed thus, *viz.* from the meridional parts anſwering to each point of latitude in your chart, ſubtract the meridional parts anſwering to the leaſt latitude, and ſet off the differences ſeverally, from the parallel of leaſt latitude, upon the two extreme meridians; and the lines joining theſe points of the meridians ſhall repreſent the ſeveral parallels upon your chart.

Thus let it be required to draw a chart that ſhall ſerve from the latitude of 20 degrees north to 60 degrees north, and that ſhall contain 80 degrees of longitude.

Having drawn the line DC to repreſent the parallel of 20 degrees (ſee No. 12.) and the meridians to it, as in the foregoing example; ſet off 663.3 (the difference between the meridional parts anſwering to 30 degrees, and thoſe of 20 degrees) from D to 30, and from C to 30; then join the points 30 and 30 with a right line, and that ſhall be the parallel of 30. Alſo ſet off 1397.6 (the difference between the meridional parts anſwering to 40 degrees, and thoſe of 20 degrees) from D to 40, and from C to 40, and joining the points 40 and 40 with a right line, that ſhall be the parallel of 40. And proceeding after the ſame way, we may draw as many of the intermediate parallels as we have occaſion for.

But if the two parallels of latitude that bound the chart, are on the contrary ſides of the equator; then draw a line repreſenting the equator and meridians to it, as in the firſt example; and from the equator ſet off on each ſide of it the ſeveral parallels contained between it and the given parallels as above, and your chart is finiſhed.

If Mercator's chart, conſtructed as above, hath its equator extended on each ſide of the point E 180 degrees, and if the ſeveral places on the ſurface of the earth be there laid down according to their latitudes and longitudes, we ſhall have what is commonly called Mercator's map of the earth. This map is not to be conſidered as a ſimilar and juſt repreſentation of the earth's ſurface; for in it the figures

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figures of countries are diſtorted, eſpecially near the poles: but ſince the degrees of latitude are every where increaſed in the ſame proportion as thoſe of longitude are, the bearings between the places will be the ſame in this chart as on the globe; and the proportions between the latitudes, longitudes, and nautical diſtances, will alſo be the ſame on this chart, as on the globe itſelf; by which means the ſeveral caſes of navigation are ſolved after a moſt eaſy manner, and adapted to the meaneſt capacities.

N. B. Here you muſt take notice, that in all charts, the upper part is the north ſide, and the lower part or bottom is the ſouth ſide; alſo that part of it towards the right hand is the eaſt, and that towards the left hand the weſt ſide of the chart.

6. Since, according to this projection, the meridians are parallel right lines; it is plain, that the rhombs which form always equal angles with the meridians, will be ſtreight lines; which property renders this projection of the earth's ſurface much more eaſy and proper for uſe than any other.

7. This method of projecting the earth's ſurface upon a plane, was firſt invented by Mr Edward Wright, but firſt publiſhed by Mercator; and hence the ſailing by the chart, was called Mercator's ſailing.

8. In No. 13. let A and E repreſent two places upon Mercator's chart, AC the meridian of A, and CE the parallel of latitude paſſing through E; draw AE, and ſet off upon AC the length AB equal to the number of minutes contained in the difference of latitude between the two places, and taken from the ſame ſcale of equal parts the chart was made by, or from the equator, or any graduated parallel of the chart, and through B draw BD parallel to CE meeting AE in D. Then AC will be the enlarged difference of latitude, AB the proper difference of latitude, CE the difference of longitude, BD the departure, AE the enlarged diſtance, and AD the proper diſtance, between the two places A and E; alſo the angle BAD will be the courſe, and AE the rhomb line between them.

9. Now ſince in the triangle ACE, BD is parallel to one of its ſides CE; it is plain the triangles ACE, ABD, will be ſimilar, and conſequently the ſides proportional. Hence ariſe the ſolutions of the ſeveral caſes in this ſailing, which are as follow.

CASE I. The latitudes of two places given, to find the meridional or enlarged difference of latitude between them.

Of this caſe there are three varieties, *viz.* either one of the places lies on the equator, or both on the ſame ſide of it; or laſtly, on different ſides.

1. If one of the propoſed places lies on the equator, then the meridional difference of latitude is the ſame with the latitude of the other place, taken from the table of meridional parts.

EXAMPLE. Required the meridional difference of latitude between St Thomas, lying on the equator, and St Antonio in the latitude of 17° 20′ north. I look in the tables for the meridional parts anſwering to 17° 20′, and find it to be 1056.2, the enlarged difference of latitude required.

2. If the two propoſed places be on the ſame ſide of the equator, then the meridional difference of latitude is found by ſubtracting the meridional parts anſwering to the leaſt latitude from thoſe anſwering to the greateſt, and the difference is that required.

EXAMPLE. Required the meridional difference of latitude between the Lizard in the latitude of 50° 00′ north, and Antigua in the latitude of 17° 30′ north.

From the meridional parts of	50°, 00′	3474.5
ſubtract the meridional parts of	17°, 30′	1066.7
there remains		2407.8

the meridional difference of latitude required.

3. If the places lie on different ſides of the equator, then the meridional difference of latitude is found by adding together the meridional parts anſwering to each latitude, and the ſum is that required.

EXAMPLE. Required the meridional difference of latitude between Antigua in the latitude of 17° 30′ north, and Lima in Peru in the latitude of 12° 30′ South.

To the merid. parts anſwering to	17°, 30′	1066.7
add theſe anſwering to	12°, 30′	756.1
the ſum is		1822.8

the meridional difference of latitude required.

CASE II. The latitudes and longitudes of two places given, to find the direct courſe and diſtance between them.

EXAMPLE. Required to find the direct courſe and diſtance between the Lizard in the latitude of 50° 00′ north, and Port-Royal in Jamaica in the latitude of 17° 40′; differing in longitude 70° 46′, Port-Royal lying ſo far to the weſtward of the Lizard.

PREPARATION.

From the latitude of the Lizard		50°, 00′
ſubtract the latitude of Port-Royal		17 , 40
and there remains		32 , 20

equal to 1940 minutes, the proper difference of latitude,

Then from the meridional parts of	50°, 00′	3474.5
ſubtract thoſe of	17 , 40	1077.2
and there remains		2397.3

the meridional or enlarged difference of longitude.

GEOMETRICALLY. Draw the line AC (No 14.) repreſenting the meridian of the Lizard at A, and ſet off from A, upon that line, AE equal to 1940 (from any ſcale of equal parts) the proper difference of latitude, alſo AC equal to 2397 3 (from the ſame ſcale) the meridional or enlarged difference of latitude. Upon the point C raiſe CB perpendicular to AC, and make CB equal to 4246 the minutes of difference of longitude.

Join AB, and through E draw ED parallel to BC: ſo the caſe is conſtructed; and AD applied to the ſame ſcale of equal parts the other legs were taken from will give the direct diſtance, and the angle DAE meaſured by the line of chords will give the courſe.

By CALCULATION.

For the angle of the courſe EAD, it will be, (by Rectangular Trigonometry,)

AC : CB :: R : T, BAC, *i. e.*

As the meridional diff. of lat. 2397.3 — 3.37970

is

is to the difference of long. — 4246.0 — 3.62798
So is radius —— —— —— 10.00000
to the tang. of the direct course 60° 33′ — 10.34828
which, because Port Royal is southward of the Lizard, and the difference of longitude westerly, will be south 60° 33′ west, or SW*b*W ½ west nearly.

Then for the distance AD, it will be, (by rectangular trigonometry)

R : AE : : Sec. A : AD, *i. e.*

As the radius — — — — 10.00000
is to the proper diff. of lat. — 1940 — 3.28780
So is the secant of the course — 60° 33′ — 10.30833
to the distance —— —— 3945.6 — 3.59613

consequently the direct course and distance between the Lizard and Port-Royal in Jamaica, is south 60° 33′, 3945.6 miles.

Case III. Course and distance sailed given, to find difference of latitude and difference of longitude.

Example. Suppose a ship from the Lizard in the latitude of 50° 00′ north, sails south 35° 40′ west 156 miles. Required the latitude come to, and how much she has altered her longitude.

Geometrically. 1. Draw the line BK (No. 15.) representing the meridian of the Lizard at B; from B draw the line BM, making with BK an angle equal to 35° 40′, and upon this line set off BM equal to 156 the given distance, and from M let fall the perpendicular MK upon BK.

Then for BK the proper difference of latitude, it will be, (by rectangular trigonometry,)

R : MB : : S, BMK : BK,

i. e. As radius — — — 10 00000
is to the distance —— 156 —— 2.19312
So is the co-sine of the course 35° 40′ — 9.90978
to the proper difference of lat. 127 —— 2.10290

equal to 2° 07′; and since the ship is sailing from a north latitude towards the south, therefore the latitude come to will be 47° 53′ north. Hence the meridional difference of latitude will be 193.4.

2. Produce BK to D, till BD be equal to 193.4; through D draw DL parallel to MK, meeting DM produced in L; then DL will be the difference of longitude: to find which by calculation, it will be, (by rectangular trigonometry,)

R : BD : : T, LBD : DL,

i. e. As radius —— —— —— 10.00000
is to the meridional diff. of lat. 193.4 — 2.28646
So is the tangent of the course 35°, 40′ — 9.85594
to minutes of diff. of long. — 138.8 —— 2.14240

equal to 2° 18′ 48″ the difference of longitude the ship has made westerly.

Case IV. Given course and both latitudes, *viz.* the latitude sailed from, and the latitude come to; to find the distance sailed, and the difference of longitude.

Example. Suppose a ship in the latitude of 54° 20′ north, sails south 33° 45′ east, until by observation she is found to be in the latitude of 51° 45′ north; required the distance sailed, and the difference of longitude.

Geometrically. Draw AB (No. 16.) to represent the meridian of the ship in the first latitude, and set off from A to B 155 the minutes of the proper difference of latitude, also AG equal to 257.9 the minutes of the enlarged difference of latitude. Through B and G, draw the lines BC and GK perpendicular to AG; also draw AK making with AG an angle of 33° 45′, which will meet the two former lines in the points C and K; so the case is constructed, and AC and GK may be found from the line of equal parts: To find which,

By Calculation:

First, For the difference of longitude, it will be, (by rectangular trigonometry,)

R : AG : : T, GAK : GK,

i. e. As radius —— —— —— 10.00000
is to the enlarged diff. of lat. — 257.9 — 2.41145
So is the tang. of the course — 33°, 45′ — 9.82489
to min. of diff. of longitude — 172.3 — 2.23634

equal to 2° 52′ 18″, the difference of longitude the ship has made easterly.

This might also have been found, by first finding the departure BC (by *Case* 2. of *Plain Sailing*,) and then it would be

AB : BC : : AG : GK, the difference of longitude required.

Then for the direct distance AC, it will be, (by rectangular trigonometry,)

R : AB : : Sec. A : AC,

i. e. As radius —— —— —— 10.00000
is to the proper diff. of lat. — 155 — 2.19033
So is the secant of the course — 33°, 45′ — 10.08015
to the direct distance —— 186.4 — 2.27048

consequently the ship has sailed south 33° 45′ east 186.4 miles, and has differed her longitude 2° 52′ 18″ easterly.

Case V. Both latitudes, and distance sailed, given; to find the direct course, and difference of longitude.

Example. Suppose a ship from the latitude of 45° 26′ north, sails between north and east 195 miles, and then by observation she is found to be in the latitude of 48° 6′ north; required the direct course and difference of longitude.

Geometrically. Draw AB (No. 17.) equal to 160 the proper difference of latitude, and from the point B raise the perpendicular BD; then take 195 in your compasses, and setting one foot of them in A, with the other cross the line BD in D. Produce AB, till AC be equal to 233.6 the enlarged difference of latitude. Thro' C draw CK parallel to BD, meeting AD produced in K: so the case is constructed; and the angle A may be measured by the line of chords, and CK by the line of equal parts: To find which,

By Calculation:

First, For the angle of the course BAD it will be, (by rectangular trigonometry)

AB : R : : AD : Sec. A. *i. e.*

As the proper diff. of lat. — 160 —— 2.20412
is to radius — — 10.00000
So is the distance —— 195 —— 2.29003
to the secant of the course — 34°, 52′ — 10.08591

which, because the ship is sailing between north and east, will be north 34° 52′ east, or NE*b*N 1° 7′ easterly.

Then for the difference of longitude, it will be, (by rectangular trigonometry,)

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R : AC : : T, A : CK.

i. e. As radius — — — 10.00000
is to the merid. diff. of lat. — 233.6 — 2.36847
ſo is the tang of the courſe — 34°, 52' — 9.84307
to min. of diff. of longitude — 162.8 — 2.21154
equal to 2° 42' 48", the difference of longitude eaſterly.

CASE VI. One latitude, courſe, and difference of longitude, given; to find the other latitude, and diſtance ſailed.

EXAMPLE. Suppoſe a ſhip from the latitude of 48° 50' north, ſails ſouth 34° 40' weſt, till her difference of longitude is 2° 44'; required the latitude come to, and the diſtance ſailed.

GEOMETRICALLY. 1. Draw AE (No. 18.) to repreſent the meridian of the ſhip in the firſt latitude, and make the angle EAC equal to 34° 40', the angle of the courſe; then draw FC parallel to AE, at the diſtance of 164 the minutes of difference of longitude, which will meet AC in the point C. From C let fall upon AE the perpendicular CE; then AE will be the enlarged difference of latitude. To find which *by Calculation*, it will be, (by rectangular trigonometry,)

T, A : R : : CE : AE,

i. e. As the tang. of the courſe 34°, 40' — 9.83984
is to the radius — — 10.00000
ſo is min. of diff. longitude — 164 — 2.21484
to the enlarged diff. of latitude — 237.2 — 2.37500
and becauſe the ſhip is ſailing from a north latitude ſoutherly, therefore,
From the merid. parts of the latitude ſailed from — 48°, 50' — 3366.9
take the merid. difference of latitude — 237.2
and there remains — — — 3129.7
the meridional parts of the latitude come to, *viz.* 46° 09'.

Hence for the proper difference of latitude,
From the latitude ſailed from — 48°, 50'N
take the latitude come to — — 46 , 09 N
and there remains — — 2 , 41
equal to 161, the minutes of difference of latitude.

2. Set off upon AE the length AD equal to 161 the proper difference of latitude, and through D draw DB parallel to CE; then AB will be the direct diſtance. To find which by *Calculation*, it will be, by rectangular trigonometry,

R : AD : : Sec. A : AB.

i. e. As radius — — 10.00000
is to the proper diff. of latitude 161 2.20683
ſo is the ſecant of the courſe 34°, 40' 10.08488
to the direct diſtance — 195.8 2.29171

CASE VII. One latitude, courſe, and departure, given; to find the other latitude, diſtance ſailed, and difference of longitude.

EXAMPLE. Suppoſe a ſhip ſails from the latitude of 54° 36' north, ſouth 42° 33' eaſt, until ſhe has made of departure 116 miles. Required the latitude ſhe is in, her direct diſtance ſailed, and how much ſhe has altered her longitude.

GEOMETRICALLY. 1. Having drawn the meridian AB, (No. 19.) make the angle BAD equal to 42° 33'. Draw FD parallel to AB at the diſtance of 116, which will meet AD in D. Let fall upon AB the perpendicular DB. Then AB will be the proper difference of latitude, and AD the direct diſtance: To find which by calculation, firſt, for the diſtance AD it will be (by rectangular trigonometry.)

S, A : BD : : R : AD.

i. e. As the ſine of the courſe 42°, 33' 9.83010
is to the departure — 116 2 06446
ſo is radius — — 10.00000
to the direct diſtance — 171.5 2.23436

Then for the proper difference of latitude, it will be, by rectangular trigonometry.

T, A : BD : : R : AB.

i. e. As the tang. of the courſe 42°, 33' 9.96281
is to the departure — 116 2.06446
ſo is radius — — 10.00000
to the proper difference of latitude 126 4 2.10165
equal to 2° 6'; conſequently the ſhip has come to the latitude of 52° 30' north, and ſo the meridional difference of latitude will be 212.2.

2. Produce AB to E, till AE be equal to 212.2; and through E draw EC parallel to BD, meeting AD produced in C; then EC will be the difference of longitude; to find which by calculation, it will be, (by rectangular trigonometry)

R : AE : : T, A : EC.

i. e. As radius — — 10.00000
is to the merid. diff. of latitude 212.2 2.32675
ſo is the tang. of the courſe 42°, 33' 9.96281
to the min. of diff. of longitude 194.8 2.28956
equal to 3° 14' 48", the difference of longitude eaſterly.

This might have been found otherwiſe, thus: becauſe the triangles ACE, ADB, are ſimilar; therefore it will be,

AB : BD : : AE : EC.

i. e. As the proper diff. of latitude 126.4 2.10165
is to the departure — 116 2.06446
ſo is the enlarged diff. of latitude 212.2 2.32675
to min. diff. of longitude — 194.8 2.28956

CASE VIII. Both latitudes and departure given, to find courſe, diſtance, and difference of longitude.

EXAMPLE. Suppoſe a ſhip from the latitude of 46° 20' N. ſails between ſouth and weſt, till ſhe has made of departure 126.4 miles; and is then found by obſervation to be in the latitude of 43° 35' north. Required the courſe and diſtance ſailed, and difference of longitude.

GEOMETRICALLY. Draw AK (No. 20.) to repreſent the meridian of the ſhip in her firſt latitude; ſet off upon it AC, equal to 165, the proper difference of latitude. Draw BC perpendicular to AC, equal to 126.4 the departure, and join AB. Set off from A, AK equal to 233.3, the enlarged difference of latitude; and through K draw KD parallel to BC, meeting AB produced in D; ſo the caſe is conſtructed, and DK will be the difference of longitude, AB the diſtance, and the angle A the courſe; to find which

BY CALCULATION:

Firſt, For DC the difference of longitude, it will be,

AC:

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AC : CB : : AK : KD.

i. e. As the proper diff. of latitude	165	2.21748
is to the departure — —	126 4	2.10175
ſo is the enlarged diff. of latitude —	233.3	2.36791
to min. of diff. longitude —	178.7	2.25218

equal to 2° 58′ 42″, the difference of longitude weſterly.

Then for the courſe it will be, (by rectangular trigonometry,)

AC : BC : : R : T, A.

i. e. As the proper diff. of latitude	165	2.21748
is to departure — —	126.4	2.10175
ſo is radius — —		10.00000
to the tangent of the courſe	37°, 27′	9.88427

which, becauſe the ſhip ſails between ſouth and weſt, will be ſouth 37° 27′ weſt, or SW*b*S 6° 30′ weſterly.

Laſtly, For the diſtance AB, it will be, (by rectangular trigonometry,)

S, A : BC : : R : AB.

i. e. As the line of the courſe	37°, 27′ —	9.78395
is to the departure —	126.4 —	2.10175
ſo is radius — —		10.00000
to the direct diſtance —	207.9 —	2.31780

CASE IX. One latitude, diſtance ſailed, and departure given; to find the other latitude, difference of longitude, and courſe.

EXAMPLE. Suppoſe a ſhip in the latitude of 48° 33′ north, ſails between ſouth and eaſt 138 miles, and has then made of departure 112.6. Required the latitude come to, the direct courſe, and difference of longitude.

GEOMETRICALLY. 1ſt, Draw BD (No. 21.) for the meridian of the ſhip at B; and parallel to it draw FE, at the diſtance of 112.6, the departure. Take 138, the diſtance, in your compaſſes, and fixing one point of them in B, with the other croſs the line FE in the point E; then join B and E, and from E let fall upon BD the perpendicular ED; ſo BD will be the proper difference of latitude, and the angle B will be the courſe; to find which, by calculation,

Firſt, for the courſe it will be, (by rectangular trigonometry,)

BE : R : : DE : S, B.

i. e. As the diſtance —	138 —	2.13988
is to radius —	—	10.00000
ſo is the departure —	112.6 —	2.05154
to the line of the courſe —	54° 41′	9.91166

which, becauſe the ſhip ſails between ſouth and eaſt, will be ſouth 54° 41′ eaſt, or SE 9° 41′ eaſterly.

Then for the difference of latitude, it will be, (by rectangular trigonometry,)

R : BE : : Co-S, B : BD.

i. e. As radius —	—	10.00000
is to the diſtance —	138 —	2.13988
ſo is the co-line of the courſe	54° 41′	9.76200
to the difference of latitude	79.8 —	1.90188

equal to 1° 19′. Conſequently the ſhip has come to the latitude of 47° 13′. Hence the meridional difference of latitude will be 117.7.

2dly, Produce B to A, till BA be equal to 117.7; and through A draw AC parallel to DE, meeting BE produced in C; then AC will be the difference of longitude; to find which by calculation, it will be,

BD : DE : : BA : AC.

i. e. As the proper diff. of latitude	79.8	1.90180
is to the departure —	112.6	2.05154
ſo is the enlarged diff. of latitude	117.7	2.07078
to the diff. of longitude —	166.1 —	2.22044

equal to 2° 46′ 06″, the difference of longitude eaſterly.

9. From what has been ſaid, it will be eaſy to ſolve a traverſe according to the rules of Mercator's ſailing.

EXAMPLE. Suppoſe a ſhip at the Lizard in the latitude 50° 00′ north, is bound to the Madera in the latitude of 32°, 20′ north, the difference of longitude between them being 11° 40′, the weſt end of the Madera lying ſo much to the weſtward of the Lizard, and conſequently the direct courſe and diſtance (by *Caſe*, 2. of this *Sect.*) is ſouth 26° 15′ weſt 1181.9 miles; but by reaſon of the winds ſhe is forced to ſail on the following courſes (allowance being made for lee-way and variation, *&c.*) *viz.* SSW 44 miles, S*b*W ½ Weſt 36 miles, SW*b*S 56 miles, and S*b*E 28 miles. Required the latitude the ſhip is in, her bearing and diſtance from the Lizard, and her direct courſe and diſtance from the Madera, at the end of theſe courſes.

The geometrical conſtruction of this traverſe is performed by laying down the two ports according to conſtruction of *Caſe* 2. of this *Sect.* and the ſeveral courſes and diſtances according to *Caſe* 3: by which we have the following ſolution by calculation.

1. Courſe SSW, diſtance 44 miles.

For difference of latitude:

As radius —	—	10.00000
is to the diſtance —	44 —	1.64345
ſo the is the co-line of the courſe	22°, 30′	9.96562
to the difference of latitude —	40.65 —	1.60907

and ſince the courſe is ſoutherly, therefore the latitude come to will be 49° 20′ north, and conſequently the meridional difference of latitude will be 61.8. Then

For difference of longitude,

As radius —	—	10.00000
is to the enlarged diff. of lat.	61 8 —	1.79099
ſo is the tang. of the courſe	22°, 30′ —	9.61722
to min. of diff. of longitude	25 6 —	1.40821

2. Courſe S*b*W ½ weſt, diſtance 36 miles.

For difference of latitude:

As radius —	—	10.00000
is to the diſtance —	36	1.55630
ſo is the co-line of the courſe	16°, 52′	9.98090
to the difference of latitude	34.46	1.53720

and ſince the courſe is ſoutherly, therefore the latitude come to will be 48° 45′. Hence the meridional difference of latitude will be 53.4. Then,

For difference of longitude:

As radius ——	——	10.00000
is to the enlarged diff. of lat.	53.4 ——	1.72754
ſo is the tan. of the courſe	16°, 52′	9.48172
to the difference of longitude	16.19 ——	1.20925

3. Courſe SW*b*S, diſtance 56 miles.

For difference of latitude:

As radius ——	——	10.00000
is to the diſtance ——	56	1.74819
ſo is the co-line of the courſe	33°, 45′	9.91985

to

to the difference of latitude —— 46 56 1.66894
consequently the latitude come to is 47° 59, and therefore the enlarged difference of latitude will be 69.2.

Then,

For difference of longitude:

As radius	——	——	10.00000
is to the enlarged diff. of lat.		69.2	1.84011
so is the tang. of the course		33° 45′	9.82489
to the difference of longitude		46.24	1.66500

4. Course S*b*E, distance 28 miles.

For difference of latitude:

As radius	——	——	10.00000
is to the distance	——	28 ——	1.44716
so is the co-sine of the course		11°, 15′	9.99157
to the difference of latitude		27.46 ——	1.43873

consequently the latitude come to will be 47°, 31′; and hence the meridional difference of latitude will be 43.2.

Then,

For difference of longitude:

As radius	——	——	10.00000
is to the enlarged diff. of lat.		43.2	1.63548
so is the tang. of the course		11°, 15′	9.29866
to the diff. of longitude		8.59	0.93414

Now these several courses and distances, together with the difference of latitude and longitude belonging to each of them, being set down in their proper columns in the *Traverse Table*, will stand as follow.

Courses	*Distances*	*Diff. of Lat.*		*Diff. of Longit.*	
		N	*S*	*E*	*W*
SSW	44	——	40.65	——	25.6
S*b*W ½W	36	——	34.46	——	16.19
SW*b*S	56	——	46.56	——	49.24
S*b*E	28	——	27.46	8.59	——
	Diff of Lat.		149.13	8.59	88.03
					8.59
				Diff. of long.	79.44

Hence it is plain that the ship has made of southing 149.13 minutes, and consequently has come to the latitude of 47° 31′ north, and so the meridional difference of latitude between that and her first latitude will be 226.1; and since she has made of difference of longitude 79.44 minutes westerly; therefore for the direct course and distance between the lizard and the ship it will be, (by *Case* 2. *of this Section*)

For the direct course:

As the merid. diff. of latitude		226.1 —	2.35430
is to radius	——	——	10.00000
so is the difference of longitude		79.44	1.90004
to the tang. of the course		— 19° 22′	9.54593

which because the difference of latitude is southerly, and the difference of longitude westerly, will be south 19° 22′ west, or S*b*W 8° 7′ westerly. Then,

For the direct distance:

As radius	——	——	10.00000
is to the proper diff. of lat		149.13	2.17349
so is the secant of the course		19° 22′	10.02530
to the direct distance		— 158 —	2.19879

From the latitude the ship is in	—	47°, 31′ N
Subtract the lat. of the Madera	—	32 , 20 N
and there remains ——	——	15 , 11

equal to 911 minutes, the proper difference of latitude between the ship and the Madera.

Again, from the merid. parts answering to the latitude the ship is in	—	3248.4
Take the meridional parts answering to the latitude of the Madera	—	2052.0
and there remains ——	——	1196.4

the enlarged difference of latitude between the ship and the Madera.

Also, from the diff. of long. between the Lizard and the Madera		11°, 40′ W
Take the difference of long. between the Lizard and the ship	—	1 , 19$\frac{44}{100}$ W
and there remains ——	——	10 , 20$\frac{56}{100}$ W

equal to 620.56 min. of difference of longitude between the ship and the Madera westerly.

Then for the direct course and distance between the ship and the Madera, it will be,

For the direct course:

As the merid. diff. of latitude		1196.4	3.07788
is to radius	——	——	10.00000
so is the difference of longitude		620.56	2.79278
to the tang. of the course		— 27°, 25′	9.71493

For the direct distance:

As radius	——	——	10.00000
is to the proper diff. of latitude		911	2.95952
so is the secant of the course		27°, 25′	10.05174
to the direct distance		1027	3.01126

10. It is very common, in working a day's reckoning at sea, to find the difference of latitude and departure to each course and distance; and adding all the departures together, and all the differences of latitudes for the whole departure, and difference of latitude made good that day, from thence (by *Case* 8. of this *Section*) to find the difference of longitude, *&c.* made good that day. Now that this method is false, will evidently appear, if we consider that the same departure reckoned on two different parallels will give unequal differences of longitude; and consequently, when several departures are compounded together and reckoned on the same parallel, the difference of longitude resulting from that cannot be the same with the sum of the differences of longitude resulting from the several departures on different parallels; and therefore we have chosen, in the last *example* of a *traverse*, to find the difference of longitude answering to each particular course and distance, the sum of which must be the true difference of longitude made good by the ship on these several courses and distances.

11. We shewed, at *Art.* 5. of this *Section*, how to construct a *Mercator's chart*; and now we shall proceed to its several uses, contained in the following problems.

PROB. 1. Let it be required to lay down a place upon

the

the chart, its latitude, and the difference of longitude between it and ſome known place upon the chart being given.

EXAMPLE. Let the known place be the Lizard lying on the parallel of 50° 00′ north, and the place to be laid down St Katharines on the eaſt coaſt of America, differing in longitude from the Lizard 42° 36′, lying ſo much to the weſtward of it.

Let L repreſent the Lizard on the chart, (ſee No. 12.) lying on the parallel of 50° 00′ north, its meridian. Set off AE from E upon the equator EQ 42° 36′, towards Q, which will reach from E to F. Through F draw the meridian FG, and this will be the meridian of St Katharines; then ſet off from Q to H upon the graduated meridian QB, 28 degrees; and through H draw the parallel of latitude HM, which will meet the former meridian in K, the place upon the chart required.

PROB. II. Given two places upon the chart, to find their difference of latitude and difference of longitude.

Through the two places draw parallels of latitude; then the diſtance between theſe parallels numbered in degrees and minutes upon the graduated meridian will be the difference of latitude required: and through the two places drawing meridians, the diſtance between theſe, counted in degrees and minutes on the equator or any graduated parallel, will be the difference of longitude required.

PROB. III To find the bearing of one place from another upon the chart.

EXAMPLE. Required the bearing of St Katharines at K. (ſee No. 12.) from the Lizard at L.

Draw the meridian of the Lizard AE, and join K and L with the right line KL; then by the line of chords meaſuring the angle KLE, and with that entering the tables, we ſhall have the thing required.

This may alſo be done, by having compaſſes drawn on the chart (ſuppoſe at two of its corners;) then lay the edge of a ruler over the two places, and let fall a perpendicular, or take the neareſt diſtance from the centre of the compaſs next the firſt place, to the ruler's edge; then with this diſtance in your compaſſes, ſlide them along by the ruler's edge, keeping one foot of them cloſe to the ruler, and the other as near as you can judge perpendicular to it, which will deſcribe the rhomb required.

PROB. IV. To find the diſtance between two given places upon the chart.

This problem admits of four caſes, according to the ſituation of the two places with reſpect to one another.

CASE I. When the given places lie both upon the equator.

In this caſe their diſtance is found by converting the degrees of difference of longitude intercepted between them into minutes.

CASE II. When the two places lie both on the ſame meridian.

Draw the parallels of thoſe places; and the degrees upon the graduated meridian, intercepted between thoſe parallels, reduced to minutes, give the diſtance required.

CASE III. When the two places lie on the ſame parallel.

EXAMPLE. Required to find the diſtance between the points K and N, (ſee No. 12.) both lying on the parallel of 28° 00′ north. Take from your ſcale the chord of 60° or radius in your compaſſes, and with that extent on KN as a baſe make the iſoſceles triangle KPN; then take from the line of ſines the co-ſine of the latitude, or ſine of 72° and ſet that off from P to S and T. Join S and T with the right line ST, and that applied to the graduated equator will give the degrees and minutes upon it equal to the diſtance; which, converted into minutes, will be the diſtance required.

The reaſon of this is evident from the ſection of *Parallel Sailing:* for it has been there demonſtrated, that radius is to the co-ſine of any parallel, as the length of any arch on the equator, to the length of the ſame arch on that parallel. Now in this chart KN is the diſtance of the meridians of the two places K and N upon the equator; and ſince, in the triangle PNK, ST is the parallel to KN, therefore PN : PT :: NK : TS. Conſequently TS will be the diſtance of the two places K and N upon the parallel of 28°.

If the parallel the two places lie on be not far from the equator, and they not far aſunder; then their diſtance may be found thus. Take the diſtance between them in your compaſſes, and apply that to the graduated meridian, ſo as the one foot may be as many minutes above, as the other is below the given parallel; and the degrees and minutes intercepted, reduced to minutes, will give the diſtance.

Or it may alſo be found thus. Take the length of a degree on the meridian at the given parallel, and turn that over on the parallel from the one place to the other, as oft as you can; then as oft as that extent is contained between the places, ſo many times 60 miles will be contained in the diſtance between them.

CASE IV. When the places differ both in longitude and latitude.

EXAMPLE. Suppoſe it were required to find the diſtance between the two places *a* and *e* upon the chart. By

PROB. II. Find the difference of latitude between them; and take that in your compaſſes from the graduated equator, which ſet off on the meridian of *a*, from *a* to *b*; then through *b* draw *bc* parallel to *de*; and taking *ac* in your compaſſes, apply it to the graduated equator, and it will ſhew the degrees and minutes contained in the diſtance required, which multiplied by 60 will give the miles of diſtance.

The reaſon of this is evident from *Art.* 8. of this *Sect.* for it is plain *ad* is the enlarged difference of latitude, and *ab* the proper; conſequently *ae* the enlarged diſtance, and *ac* the proper.

PROB. V. To lay down a place upon the chart, its latitude and bearing from ſome known place upon the chart being known, or (which is the ſame) having the courſe and difference of latitude that a ſhip has made, to lay down the running of the ſhip, and find her place upon the chart.

EXAMPLE. A ſhip from the Lizard in the latitude of 50° 00′ north, ſails SSW till ſhe has differed her latitude 36′ 40′. Required her place upon the chart.

Count from the Lizard at L, on the graduated meridian downwards (becauſe the courſe is ſoutherly) 36′ 40′ to *g*; through

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through which draw a parallel of latitude, which will be the parallel the ſhip is in; then from L draw a SSW line *Lf*, cutting the former parallel in *f*, and this will be the ſhip's place upon the chart.

PROB. VI. One latitude, courſe, and diſtance, ſailed, given; to lay down the running of the ſhip, and find her place upon the chart.

EXAMPLE. Suppoſe a ſhip at *a* in the latitude of 20° 00′ north; ſails north 37° 20′, eaſt 191 miles: Required the ſhip's place upon the chart.

Having drawn the meridian and parallel of the place *a*, ſet off the rhomb line *ae*, making with *ab* an angle of 37° 20′; and upon it ſet off 191 from *a* to *c*; through *c* draw the parallel *cb*; and taking *ab* in your compaſſes, apply it to the graduated equator, and obſerve the number of degrees it contains; then count the ſame number of degrees on the graduated meridian from C to *b*, and through *b* draw the parallel *be*, which will cut *ac* produced in the point *e*, the ſhip's place required.

PROB. VII. Both latitudes and diſtance ſailed, given; to find the ſhip's place upon the chart.

EXAMPLE. Suppoſe a ſhip ſails from *a*, in the latitude of 20° 00′ north, between north and eaſt 191 miles, and is then in the latitude of 45° 00′ north: Required the ſhip's place upon the chart.

Draw *de* the parallel of 45°, and ſet off upon the meridian of *a* upwards, *ab* equal to the proper difference of latitude taken from the equator or graduated parallel. Through *b* draw *bc* parallel to *de*; then with 191 in your compaſſes, fixing one foot of them in *a*, with the other croſs *be* in *c*. Join *a* and *c* with the right line *ac*; which produced will meet *de* in *e*, the ſhip's place required.

PROB VIII. One latitude, courſe and difference of longitude, given; to find the ſhip's place upon the chart.

EXAMPLE. Suppoſe a ſhip from the Lizard in the latitude of 50° 00′ north, ſails SW*b*W, till her difference of longitude is 42° 36′: Required the ſhip's place upon the chart.

Having drawn AE the meridian of the Lizard at L, count from E to F upon the equator 42° 36′; and through F draw the meridian EG; then from L draw the SW*b*W line LK, and where this meets FG, as at K, will be the ſhip's place required.

PROB. IX. One latitude, courſe, and departure, given; to find the ſhip's place upon the chart.

EXAMPLE. Suppoſe a ſhip at *a* in the latitude of 20° 00′ north, ſails north 37° 20′ eaſt, till ſhe has made of departure 116 miles: Rqeuired the ſhip's place upon the chart.

Having drawn the meridian of *a*, at the diſtance of 116, draw parallel to it the meridian *k l*. Draw the rhomb line *ac*, which will meet *k l* in ſome point *c*; then through *c* draw the parallel *c b*, and *a b* will be the proper difference of latitude, and *b c* the departure. Take *a b* in your compaſſes, and apply it to the equator or graduated parallel; then obſerve the number of degrees it contains, and count ſo many on the graduated meridian from C upwards to *b*. Through *b* draw the parallel *b e*, which will meet *a c* produced in ſome point as *e*, which is the ſhip's place upon the chart.

PROB. X. One latitude, diſtance, and departure, given; to find the ſhip's place upon the chart.

EXAMPLE. Suppoſe a ſhip at *a* in the latitude of 20° 00′ north, ſails 191 miles between north and eaſt, and then is found to have made of departure 116 miles: Required the ſhip's place upon the chart.

Having drawn the meridian and parallel of the place *a*, ſet off upon the parallel *a m* equal to 116, and through *m* draw the meridian *k l*. Take the given diſtance 191 in your compaſſes; ſetting one foot of them in *a*, with the other croſs *k l* in *c*. Join *a c*, and through *c* draw the parallel *c b*; ſo *c b* will be the departure, and *a b* the proper difference of latitude; then proceeding with this, as in the foregoing problem, you will find the ſhip's place to be *e*.

PROB XI. The latitude ſailed from, difference of latitude, and departure, given; to find the ſhip's place upon the chart.

EXAMPLE. Suppoſe a ſhip from *a* in the latitude of 20° 00′ north, ſails between north and eaſt, till ſhe be in the latitude of 45° 00′ north, and is then found to have made of departure 116 miles: Required the ſhip's place upon the chart.

Having drawn the meridian of *a*, ſet off upon it, from *a* to *b*, 25 degrees, (taken from the equator or graduated parallel,) the proper difference of latitude; then thro' *b* draw the parallel *b c*, and make *b c* equal to 116 the departure, and join *a c*. Count from the parallel of *a* on the graduated meridian upwards to *b* 25 degrees, and through *b* draw the parallel *b e*, which will meet *ac* produced in ſome point *e*, and this will be the place of the ſhip required.

12. In the ſection of *Plain Sailing* it is plain that the terms *meridional diſtance*, *departure*, and *difference of longitude*, were ſynonymous, conſtantly ſignifying the ſame thing; which evidently followed from the ſuppoſition of the earth's ſurface being projected on a plane, in which the meridians were made parallel, and the degrees of latitude equal to one another and to thoſe of the equator. But ſince it has been demonſtrated (in this ſection) that if, in the projection of the earth's ſurface upon a plane, the meridians be made parallel, the degrees of latitude muſt be unequal, ſtill increaſing the nearer they come to the pole. It follows that theſe terms muſt denote lines really different from one another.

Sect. 6. *Of* OBLIQUE SAILING.

THE queſtions that may be propoſed on this head being innumerable, we ſhall only give a few of the moſt uſeful.

PROB. I. Coaſting along the ſhore, I ſaw a cape bear from me NNE; then I ſtood away NW*b*W 20 miles, and I obſerved the ſame cape to bear from me NE*b*E. Required the diſtance of the ſhip from the cape at each ſtation.

GEOMETRICALLY. Draw the circle NWSE (No. 22.) to repreſent the compaſs, NS the meridian, and WE the eaſt and weſt line, and let C be the place of the ſhip in her firſt ſtation; then from C ſet off upon the NW*b*W line, CA 20 miles, and A will be the place of the ſhip in her ſecond ſtation.

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From C draw the NNE line CB, and from A draw AB parallel to the NE*b*E line CD, which will meet CB in B the place of the cape, and CB will be the diſtance of it from the ſhip in its firſt ſtation, and AB the diſtance in the ſecond: to find which,

By CALCULATION;

In the triangle ABC are given AC, equal to 20 miles; the angle ACB, equal to 78° 45′, the diſtance between the NNE and NW*b*W lines; alſo the angle ABC, equal to BCD, equal to 53° 45′, the diſtance between the NNE and NB*b*E lines; and conſequently the angle A, equal to 67° 30′.

Hence for CB, the diſtance of the cape from the ſhip in her firſt ſtation, it will be (by oblique trigonometry)

S. ABC : AC :: S. BAC : CB,

i. e. As the ſine of the angle B		33° 45′	9.74473
is to the diſtance run AC	—	20 —	1.30103
ſo is the ſine of BAC	—	67 , 30	9.96562
to CB	— —	33.26	1.52191

the diſtance of the cape from the ſhip at the firſt ſtation. Then for AB, it will be, by oblique trigonometry,

S. ABC : AC :: S. ACB : AB.

i. e. As the ſine of B	—	33°, 45′	9.74474
is to AC	— —	20 —	1.30103
ſo is the ſine of C	—	78 - 45	9.99157
to AB	— —	35.31	1.54786

the diſtance of the ſhip from the cape at her ſecond ſtation.

PROB. II. Coaſting along the ſhore, I ſaw two headlands; the firſt bore from me NE*b*E 17 miles, the other SSW miles. Required the bearing and diſtance of theſe headlands from one another.

GEOMETRICALLY. Having drawn the compaſs NWSE (No. 23.) let C repreſent the place of the ſhip; ſet off upon the NE*b*E line CA 17 miles from C to A, and upon the SSW line CB 20 miles from C to B, and join AB: then A will be the firſt headland, and B the ſecond; alſo AB will be their diſtance, and the angle A will be the bearing from the NE*b*N line: to find which

By CALCULATION;

In the triangle ACB are given, AC 17, CB 20, and the angle ACB equal to 101° 15′, the diſtance between the NE*b*E and SSW lines. Hence (by oblique angular trigonometry) it will be

As the ſum of the ſides AC and CB		37	1.56820
is to their difference	—	3	0.47712
ſo is the tang. of ½ the ſum of the angles A and B	}	39°, 22½	9.91417
to the tang. of half their diff.		3 , 49	8.82309

conſequently the angle A will be 43° 11′, and the angle B 35° 34′; alſo the bearing of B from A will be S*b*W 1° 49 weſterly, and the bearing of A from B will be N*b*E 1° 49′ eaſterly.

Then for the diſtance AB, it will be, by oblique-angular trigonometry,

S. A : CB :: S. C : AB.

i. e. As the ſine of A		43°, 11′	9.83527
is to CB	—	20 —	1.30103
ſo is the ſine of C	—	101, 15 —	9.99157
to AB	— —	28.67 —	1.45733

the diſtance between the two headlands.

PROB. III. Coaſting along the ſhore, I ſaw two headlands; the firſt bore from me NW*b*N, and the ſecond NNE; then ſtanding away E*b*N ¼ northerly 20 miles, I found the firſt bore from me WNW ½ weſterly, and the ſecond N*b*W ½ weſterly. Required the bearing and diſtance of theſe two headlands.

GEOMETRICALLY. Having drawn the compaſs NWSE (No. 24.) let C repreſent the firſt place of the ſhip; from which draw the NW*b*N line CB, and the NNE line CD, alſo the E*b*N ¼ N line CA, which make equal to 20. From A draw AB parallel to the WNW ½ W line, and AD parallel to the N*b*W ½ W meeting the two firſt lines in the points B and D; then B will be the firſt and D the ſecond headlands. Join the points B and D, and BD will be the diſtance between them, and the angle CDB the bearing from the NNE line: to find which

By CALCULATION;

1. In the triangle ABC are given the angle BCA, equal to 104° 04′, the diſtance between the NW*b*N line, and the ENE¼E line; the angle BAC, equal to 36° 34′, the diſtance between the WSW¼W line and the WNW ¼W line; the angle ABC equal to 39° 22′, the diſtance between the ESE¼E line; and the SW*b*S line, alſo the ſide CA equal to 20 miles: whence for CB, it will be (by oblique trigonometry)

As the ſine of CBA	——	39°, 22′ —	9.80228
is to AC	—— ——	20 ——	1.30103
ſo is the ſine of CAB	——	36°, 34′ —	9.77507
to CB	—— ——	18.79 —	1.27382

the diſtance between the firſt headland and the ſhip in her firſt ſtation.

2. In the triangle ACD, are given the angle ACD, equal to 47° 49′, the diſtance between the ENE¼E line, and the NNE line; the angle CAD, equal to 92° 49′, the diſtance between the WSW¼W line; and the N*b*W¼ W line, the angle CDA equal to 39° 22′, the diſtance between the SSW line and the S*b*E¼E line; alſo the leg CA equal to 20.

Hence for CD, it will be (by oblique trigonometry)

As the ſine CAD	——	39°, 22′ —	9.80228
is to AC	—— ——	20 ——	1.30103
ſo is the ſine of CAD	——	92°, 34′ —	9.99960
to CD	—— ——	31.5 —	1.49835

the diſtance between the ſecond headland and the ſhip in her firſt ſtation.

3. In the triangle BCD are given BC 18.79, CD 31.5, and the angle BCD equal to 56° 15′, the diſtance between the NW*b*N line and the NNE line.

Hence for the angle CDB, it will be (by oblique trigonometry)

As the ſum of the ſides	—	50.29 ——	1.70148
is to the difference of ſides		12.71 ——	1.10415
ſo is tangent of ½ ſum of the unknown angles	}	— 61°, 51′ —	10.27189
to tang. of half their diff.		25 , 18 —	9.67458

conſequently the angle CBD is 87° 10′, and the angle CDB 36° 35′. Hence the bearing of the firſt headland from the ſecond will be S 59° 8′, W or SW*b*W¼W nearly; and for the diſtance between them, it will be,

As the ſine of BDC	——	36°, 35′ —	9.77524
is to BC	—— ——	18.79 —	1.27382

ſo,

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ſo is the ſine of BCD	——	56°, 15′ —	9.91985
to BD	—— ——	26 21 ——	1 41843

the diſtance between the two headlands.

This, and the firſt problem, are of great uſe in drawing the plot of any harbour, or laying down any ſea coaſt.

Suppoſe a ſhip that makes her way good within 6 ½ points of the wind, at north, is bound to a port bearing eaſt 86 miles diſtance from her: Required the courſe and diſtance upon each tack, to gain the intended port.

GEOMETRICALLY. Having drawn the compaſs NE SW, (No. 25.) let C repreſent the ſhip's place, and ſet off upon the eaſt line CA 86 miles, ſo A will be the intended port. Draw CD and CB on each ſide of the north line at 6 ½ points diſtance from it, and through A draw AB parallel to CD meeting CB in B; then the ENE ½ E line CB, will be the courſe of the ſhip upon the ſtarboard tack, and CB its diſtance on that tack; alſo the ESE ½ E line Ab, will be the courſe on the larboard tack, and BA the diſtance on that tack: to find which

By CALCULATION;

In the triangle ABC are given, the angle ACB, equal to 16°. 53′, the diſtance between the eaſt and ENE ½ E line; the angle CBA, equal to 146° 14′, the diſtance between the ENE ½ E and the WNW ½ W lines; the angle BAC equal to 16° 53′, the diſtance between the eaſt and ESE ½ E lines; alſo AC 86 miles.

Hence ſince the angle at A and C are equal, the legs CB and BA will likewiſe be equal; to find either of which (ſuppoſe CB) it will be (by oblique angled trigonometry.)

As the ſine of B	— 146°, 14′	—	9 74493
is to AC	— 86	—	1.93450
ſo is the ſine of A	— 16, 53	—	9.46303
to CB	—— 44.94	——	1.65260

the diſtance the ſhip muſt ſail on each tack.

There is a great variety of uſeful queſtions of this nature that may be propoſed; but the nature of them being better underſtood by practice at ſea, we ſhall leave them, and go on to *Current Sailing*.

Sect. 7. *Concerning* CURRENTS, *and how to make proper allowances.*

1. CURRENTS are certain ſettings of the *ſtream*, by which all bodies (as ſhips, *&c.*) moving therein, are compelled to alter their courſe or velocity, or both; and ſubmit to the motion impreſſed upon them by the current.

CASE I. If the current ſets juſt with the courſe of the ſhip, (*i e*) moves on the ſame rhomb with it; then the motion of the ſhip is increaſed, by as much as is the driſt or velocity of the current.

EXAMPLE Suppoſe a ſhip ſails SE*b*S at the rate of 6 miles an hour, in a current that ſets SE*b*S 2 miles an hour: Required her true rate of ſailing.

Here it is evident that the ſhip's true rate of ſailing will be 8 miles an hour.

CASE II. If the current ſets directly againſt the ſhip's courſe, then the motion of the ſhip is leſſened by as much as is the velocity of the current.

EXAMPLE. Suppoſe a ſhip ſails SSW at the rate of 10 miles an hour, in a current that ſets NNE 6 miles an hour. Required the ſhip's true rate of ſailing.

Here it is evident that the ſhip's true rate of ſailing will be 4 miles an hour. Hence it is plain,

COR. I. If the velocity of the current be leſs than the velocity of the ſhip, then the ſhip will get ſo much ahead as is the difference of theſe velocities.

COR. II. If the velocity of the current be greater than that of the ſhip, then the ſhip will fall ſo much aſtern as is the difference of theſe velocities.

COR. III. Laſtly, If the velocity of the current be equal to that of the ſhip, then the ſhip will ſtand ſtill; the one velocity deſtroying the other.

CASE III. If the current thwarts the courſe of the ſhip, then it not only leſſens or augments her velocity, but gives her a new direction compounded of the courſe ſhe ſteers, and the ſetting of the current, as is manifeſt from the following

LEMMA. If a body at A (No. 26.) be impelled by two forces at the ſame time, the one in the direction AB capable to carry that body from A to B in a certain ſpace of time, and the other in the direction AD capable to carry it from A to D in the ſame time; complete the parallelogram ABCD, and draw the diagonal AC; then the body at A agitated by theſe two forces together, will move along the line BC, and will be in the point C at the end of the time in which it would have moved along AD or AB with the forces ſeparately applied.

Hence the ſolution of the following examples will be evident.

EXAMPLE I. Suppoſe a ſhip ſails (by the compaſs) directly ſouth 96 miles in 24 hours, in a current that ſets eaſt 45 miles in the ſame time. Required the ſhip's true courſe and diſtance.

GEOMETRICALLY. Draw AD (ſee No. 26.) to repreſent the ſouth and north line of the ſhip at A, which make equal to 96; from D draw DC perpendicular to AD, equal to 45; and join AC. Then C will be the ſhip's true place, AC her true diſtance, and the angle CAD the true courſe. To find which

By CALCULATION:

Firſt, For the true courſe DAC, it will be, (by rectangular trigonometry,)

As the apparent diſtance AD	— 96	—	1.98227
is to the current's motion DC	— 45	—	1 65321
ſo is radius	—— ——	——	10.00000
to the tangent of the true courſe DAC	——	— 25°, 07′	9.67094

conſequently the ſhip's true courſe is S 25° 07′ E, or SSE 2° 37′, eaſterly.

Then for the true diſtance AC, it will be, (by rectangular trigonometry,)

As the ſine of the courſe A	——	25°, 07′	9.62784
is to the departure DC	——	45 —	1.65321
ſo is radius	—— ——	——	10.00000
to the true diſtance AC	——	106 —	2.02537

EXAMPLE. Suppoſe a ſhip ſails SE 120 miles in 20 hours, in a current that ſets W*b*N at the rate of 2 miles an hour: Required the ſhip's true courſe and diſtance ſailed in that time.

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GEOMETRICALLY. Having drawn the compaſs NESW (No 27.) let C repreſent the place the ſhip ſailed from; draw the SE line CA, which make equal to 120; then will A be the place the ſhip caped at.

From A draw AB parallel to the W½N line CD, equal to 40, the motion of the current in 20 hours, and join CB; then B will be the ſhip's true place at the end of 20 hours, CB her true diſtance, and the angle SCB her true courſe. To find which

By CALCULATION;

In the triangle ABC, are given CA 120, AB 40, and the angle CAB equal to 34° 45', the diſtance between the E½S and SE lines, to find the angles B and C, and the ſide CB.

Firſt, For the angles C and B, it will be, (by oblique trigonometry)

As the ſum of the ſides CA and AB	160	—	2.20412
is to their difference ——	80	—	1.90309
ſo is the tang. of half the ſum of the angles B and C —	73°, 07'		10.51783
to the tang. of half their diff. —	59, 45		10.21680

conſequently the angle B will be 131, 52, and the angle ACB 14° 23'. Hence the true courſe is S 30°, 37' E, or SSE 2° 07' eaſterly.

Then for the true diſtance CB, it will be, (by oblique trigonometry)

As the ſine of B ——	131°, 52'	—	9.87198
is to AC —— ——	120	——	2 07918
ſo is the ſine of A ——	33°, 45'	—	9.74474
to the true diſtance CB ——	89.53	—	1.95194

EXAMPLE III. Suppoſe a ſhip coming out from ſea in the night, has ſight of Scilly light, bearing NE½N diſtance 4 leagues, it being then flood tide ſetting ENE 2 miles an hour, and the ſhip running after the rate of 5 miles an hour. Required upon what courſe and how far ſhe muſt ſail to hit the Lizard, which bears from Scilly E¼S diſtance 17 leagues.

GEOMETRICALLY. Having drawn the compaſs NESW (No. 28.) let A repreſent the ſhip's place at ſea, and draw the NE½N line AS, which make equal to 12 miles, ſo S will repreſent Scilly.

From S draw SL equal to 51 miles, and parallel to the E¼S line; then L will repreſent the Lizard.

From L draw LC parallel to the ENE line, equal to 2 miles, and from C draw CD equal to 5 miles meeting AL in D; then from A draw AB parallel to CD meeting LC produced in B; and AB will be the required diſtance, and SAB the true courſe. To find which

By CALCULATION;

In the triangle ASL are given the ſide AS equal to 12 miles, the ſide SL equal to 51, and the angle ASL equal to 118° 07', the diſtance between the NE½N and W¼N lines; to find the angles SAL and SLA. Conſequently, (by oblique trigonometry,) it will be,

As the ſum of the ſides AS and SL —	63		1.79934
is to their difference —— —	39		1.59106
ſo is the tang. of half the ſum of the angles SAL and SLA	30°, 56'		9.77763
to the tang. of half their diff. —	20°, 21'		9.56935

conſequently the angle SAL, will be 51° 17', and ſo the direct bearing of the Lizard from the ſhip will be N 85° 02' E, or E½N 6° 17' E; and for the diſtance AL, it will be (by oblique trigonometry,)

As the ſine of SAL —	51°, 17'	—	9.89223
is to SL —— ——	51	—	1.70757
ſo is the ſine of ASL —	118°, 07'	—	9.94546
to AL —— ——	57.65	——	1.76080

the diſtance between the ſhip and the Lizard.

Again, in the triangle DLC, are given the angle L equal to 17° 32', the diſtance between the ENE and N 85° 02' E lines; the ſide LC, equal to 2 miles, the current's drift in an hour; and the ſide CD, equal to 5 miles, the ſhip's run in the ſame time. Hence for the angle D, it will be (by oblique trigonometry,)

As the ſhip's run in 1 hour DC —	5	—	0.69897
is to the ſine of L ——	17°, 32'	—	9.47894
ſo is the current's drift LC —	2	—	0.30103
to the ſine of D —— ——	6°, 55'	—	9 08100

conſequently ſince by conſtruction the angle LAB is equal to the angle LDC, the courſe the ſhip muſt ſteer is S 88° 03' E.

Then for the diſtance AB, it will be (by oblique trigonometry,)

As the ſine of B ——	155°, 33'	—	9.61689
is to AL —— ——	57.65	——	1.76080
ſo is the ſine of L ——	17.32	——	9 47894
to AB —— ——	41.96	——	1.62285

conſequently, ſince the ſhip is ſailing at the rate of 5 miles an hour, it follows, that in ſailing 8h 24m S 88° 03' E, ſhe will arrive at the Lizard.

EXAMPLE IV. A ſhip from a certain headland in the latitude of 34° 00' north, ſails SE½S 12 miles in three hours, in a current that ſets between north and eaſt; and then the ſame headland is found to bear WNW, and the ſhip to be in the latitude of 33° 52' north. Required the ſetting and drift of the current.

GEOMETRICALLY. Having drawn the compaſs NESW (No. 29.) let A repreſent the place of the ſhip, and draw the SE½S line AB equal to 12 miles, alſo the ESE line AC.

Set off from A upon the meridian AD, equal to 8 miles, the difference of latitude, and through D draw DC parallel to the eaſt and weſt line WE, meeting AC in C. Join C and B with the right line BC; then C will be the ſhip's place, the angle ABC the ſetting of the current from the SE½S line, and the line BC will be the drift of the current in 3 hours. To find which

By CALCULATION:

In the triangle ADC, right angled at D, are given the difference of latitude AD equal to 8 miles, the angle DAC equal to 67° 30'. Whence for AC, the diſtance the ſhip has ſailed, it will be

As radius —— —— ——			10 00000
is to the diff. of latitude AD —	8	—	0.90309
ſo is the ſecant of the courſe DAC — —	67°, 30'		10.41716
to the diſtance run AC ——	20.9	—	1.32025

Again, in the triangle ABC, are given AB equal to 12

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12 miles, AC equal to 20.9, and the angle BAC equal to 33° 45', the diſtance between the SE*b*S and ESE lines. Whence for the angle at B, it will be,

As the ſum of the ſides AC and AB	32.9		1.51720
is to their difference	—	— 8.9 —	0.94930
ſo is the tang. of half the ſum of the angles B and C	73°, 07' —		10.51806
to tang. of ½ their diff.	— 41°, 43' ½ —		9.95035

conſequently the angle B is 114° 51', and ſo the ſetting of the current will be N 81° 06' E or E*b*E 2° 21' E. Then for BC the current's drift in 3 hours, it will be,

As the ſine of B	— 114°, 51'	—	9.92700
is to the diſtance run AC	20.9	—	1.32025
ſo is the ſine of A	— 33°, 45'	—	9.74474
to BC	— —	12.8 —	1.10719

the current's drift in 3 hours, and conſequently the current ſets E*b*N 2° 21' E 4.266 miles an hour.

Sect. 8. *Concerning the* VARIATION *of the* COMPASS, *and how to find it from the true and obſerved* AMPLITUDES *or* AZIMUTHS *of the ſun.*

1. THE variation of the compaſs is how far the north or ſouth point of the needle ſtands from the true ſouth or north point of the horizon towards the eaſt or weſt; or it is an arch of the horizon intercepted between the meridian of the place of obſervation and the magnetic meridian.

2. It is abſolutely neceſſary to know the variation of the compaſs at ſea, in order to correct the ſhip's courſe; for ſince the ſhip's courſe is directed by the compaſs, it is evident that if the compaſs be wrong the true courſe will differ from the obſerved, and conſequently the whole reckoning differ from the truth.

3. The ſun's true amplitude is an arch of the horizon comprehended between the true eaſt or weſt point thereof, and the centre of the ſun at riſing or ſetting; or it is the number of degrees, *&c.* that the centre of the ſun is diſtant from the true eaſt or weſt point of the horizon, towards the ſouth or north.

4. The ſun's magnetic amplitude is the number of degrees that the centre of the ſun is from the eaſt or weſt point of the compaſs, towards the ſouth or north point of the ſame at riſing or ſetting.

5. Having the declination of the ſun, together with the latitude of the place of obſervation, we may from thence find the ſun's true amplitude, by the following aſtronomic propoſition, *viz.*

As the co-ſine of the latitude
is to the radius
So is the ſine of the ſun's declination
to the ſine of the ſun's true amplitude
which will be north or ſouth according as the ſun's declination is north or ſouth.

EXAMPLE. Required the ſun's true amplitude in the latitude of 41° 50' north, on the 23d day of April 1731.

Firſt, I find (from the tables of the ſun's declination) that the ſun's declination the 23d of April is 15°54' north; then for the true amplitude, it will be, by the former analogy.

As the co ſine of the lat.	41° 50'	—	9.87221
is to radius	— —	—	10.00000
ſo is the ſine of the decl.	15°, 54',	—	9.43769
to the ſine of the amplit.	21 , 35 ,	—	9.56548

which is north, becauſe the declination is north at that time; and conſequently, in the latitude of 41° 50' north, the ſun riſes on the 23d of April 21° 35' from the eaſt part of the horizon towards the north, and ſets ſo much from the weſt the ſame way.

6. The ſun's true azimuth is the arch of the horizon intercepted between the meridian and the vertical circle paſſing through the centre of the ſun at the time of obſervation.

7. The ſun's magnetic azimuth is the arch of the horizon intercepted between the magnetic meridian and the vertical, paſſing through the ſun.

8. Having the latitude of the place of obſervation, together with the ſun's declination and altitude at the time of obſervation, we may find his true azimuth after the following method, *viz.*

Make it,
As the tangent of half the complement of the latitude is to the tangent of half the ſum of the diſtance of the ſun from the pole and complement of the altitude
So is the tangent of half the difference between the diſtance of the ſun from the pole and complement of the altitude
To the tangent of a fourth arch
which fourth arch added to half the complement of the latitude will give a fifth arch, and this fifth arch leſſened by the complement of the latitude will give a ſixth arch.
Then make it
As the radius
is to the tangent of the altitude
ſo is the tangent of the ſixth arch
to the co ſine of the ſun's azimuth
which is to be counted from the ſouth or north, to the eaſt or weſt, according as the ſun is ſituated with reſpect to the place of obſervation.

If the latitude of the place and declination of the ſun be both north or both ſouth, then the declination taken from 90° will give the ſun's diſtance from the pole; but if the latitude and declination be on contrary ſides of the equator, then the declination added to 90° will give the ſun's diſtance from the neareſt pole to the place of obſervation.

EXAMPLE. In the latitude of 51° 32' north, the ſun having 19° 39' north declination, his altitude was found by obſervation to be 38° 18: Required the azimuth.

By the firſt of the foregoing analogies, it will be

As the tangent of ½ the complement of the latitude	19°, 14'	9.54269
is to the tagent of ½ the ſum of the diſtance of the ſun from the pole and complement of the altitude —	61 ,, 01	10.25655
ſo is the tangent of half their difference —	9 ,, 19	7.21499
to the tang. of a 4th arch	40 ,, 20	9.92885

which fourth arch 40° 20', added to 19° 14' half the complement of the latitude, give a fifth arch 59° 34'; and this fifth arch leſſened by 38° 28', the complement of the latitude, gives the ſixth arch 21° 06'; then for the

the azimuth, it will be, by the ſecond of the preceding analogies,

As radius	—— ——	10.00000
is to the tang. of the altitude	38°, 18′	9.89749
ſo is the tang. of the ſixth arch	21 ,, 06 —	9.58644
to the co-ſine of the azimuth	72 ,, 15 —	9.48393

which, becauſe the latitude is north and the ſun ſouth of the place of obſervation, muſt be counted from the ſouth towards the eaſt or weſt; and conſequently, if the altitud of the ſun was taken in the morning, the azimuth will be S 72° 15′ E, or ESE 4° 45′ E; but if the altitude was taken in the afternoon, the azimuth will be S 72° 15′ W, or WSW 4° 45′ weſterly.

9. Having found the ſun's true amplitude or azimuth by the preceding analogies, and his magnetic amplitude or azimuth by obſervation, it is evident, if they agree, there is no variation; but if they diſagree, then if the true and obſerved amplitudes at the riſing or ſetting of the ſun be both of the ſame name, *i. e.* either both north, or both ſouth, their difference is the variation; but if they be of different names, *i. e.* one north and the other ſouth, their ſum is the variation. Again, if the true and obſerved azimuth be both of the ſame name, *i. e.* either both eaſt or both weſt, their difference is the variation; but if they be of different names, their ſum is the variation: And to know whether the variation is eaſterly, obſerve this general rule, *viz.*

Let the obſerver's face be turned to the ſun: then if the true amplitude or azimuth be to the right hand of the obſerved, the variation is eaſterly; but if it be to the left, weſterly.

To explain which, let NESW (No. 30.) repreſent a compaſs, and ſuppoſe the ſun is really E*b*S at the time of obſervation, but the obſerver ſees him off the eaſt point of the compaſs, and ſo the true amplitude or azimuth of the ſun is to the right of the magnetic or obſerved; here it is evident that the E*b*S point of the compaſs ought to lie where the eaſt point is, and ſo the north where the N*b*W is; conſequently the north point of the compaſs is a point too far eaſt, *i. e.* the variation in this caſe is eaſterly. The ſame will hold when the amplitude or azimuth is taken on the weſt ſide of the meridian.

Again, let the true amplitude or azimuth be to the left hand of the obſerved. Thus, ſuppoſe the ſun is really E*b*N at the time of obſervation, but the obſerver ſees him off the eaſt point of the compaſs, and ſo the true amplitude or azimuth to the left of the obſerved: Here it is evident that the E*b*N point of the compaſs ought to ſtand where the eaſt point is, and ſo the north where the N*b*E point is; conſequently the north point of the compaſs lies a point too far weſterly, ſo in this caſe the variation is weſt. The ſame will hold when the ſun is obſerved on the weſt ſide of the meridian.

EXAMPLE I. Suppoſe the ſun's true amplitude at riſing is found to be E 14° 20′ N, but by the compaſs it is found to be E 26° 12′: Required the variation, and which way it is.

Since they are both the ſame way, therefore

From the magnetic amplitude	——	E 26°, 12′ N.
take the true amplitude	— —	E 14 . 20 N.
and there remains the variation	——	11 , 52 E.

which is eaſterly, becauſe in this caſe the true amplitude is the right of the obſerved.

EXAMPLE II. Suppoſe the ſun's true amplitude at ſetting is W 34° 26′ S, and his magnetic amplitude W 23° 13′ S: Required the variation, and which way it is.

Since they lie both the ſame way, therefore

From the ſun's true amplitude	—	W 34°, 26′ S.
take his magnetic amplitude	—	W 23 , 13 S.
there remains the variation	—	11 , 13 W.

which is weſterly, becauſe the true amplitude, in this caſe, is to the left hand of the obſerved.

EXAMPLE III. Suppoſe the ſun's true altitude at riſing is found to be 13° 24′ N, and his magnetic E 12° 32′ S: Required the variation, and which way it lies.

Since the true and obſerved amplitudes lie different ways, therefore

To the true amplitude	—	E 13°, 24′ N.
add the magnetic amplitude	—	E 12 , 32 S.
the ſum is the variation	—	25 , 56 W.

which is weſterly, becauſe the true amplitude is, in this caſe, to the left of the obſerved.

EXAMPLE IV. Suppoſe the ſun's true altitude at ſetting is found to be W 8° 24′ N, but his magnetic amplitude is W 10° 13′ S: Required the variation.

To the true amplitude	—	W 8°, 24′ N.
add the magnetic	— —	W 10 , 13 S.
the ſum is the variation	——	18 , 37 E.

which is eaſterly, becauſe the true amplitude is to the right of the obſerved.

EXAMPLE V. Suppoſe the ſun's true azimuth at the time of obſervation, is found to be N 86° 40′ E, but by the compaſs it is N 73° 24′ E: Required the variation, and which way it lies.

From the ſun's true azimuth,	—	N 86°, 40′ E.
take the magnetical,	—	N 73 , 24 E.
there remains the variation,	——	13 , 16 E.

which is eaſterly, becauſe the true azimuth is to the right of the obſerved.

EXAMPLE VI. Suppoſe the ſun's true azimuth is S 3° 24′ E. and the magnetical S 4° 36′ W: Required the variation, and which way it lies.

To the true azimuth	—— ——	S 3°, 24′ E.
add the magnetical azimuth	——	S 4 , 36 W.
the ſum is the variation	——	8 , 00 W.

which is weſterly, becauſe the true azimuth is, in this caſe, to the left of the obſerved.

10. The variation of the compaſs was firſt obſerved at London, in the year 1580, to be 11° 15′ eaſterly, and in the year 1622 it was 6° 0′ E; alſo in the year 1634, it was 4° 05′ E, ſtill decreaſing, and the needle approaching the true meridian, till it coincided with it, and then there was no variation; after which, the variation

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tion began to be westerly; and in the year 1672, it was observed to be 2° 30' W; also in the year 1683, it was 4° 30' W; and since that time the variation still continues at London to increase westerly; but how far it will go that way, time and observations will probably be the only means to discover.

Again, at Paris, in the year 1640, the variation was 3° 00' E; and in the year 1666, there was no variation; but in the year 1681, it was 2° 30' W, and still continues to go westerly.

In short, from observations made in different parts of the world, it appears, that in different places the variation differs both as to its quantity and denomination, it being east in one place, and west in another; the true cause and theory of which, for want of a sufficient number of observations, has not as yet been fully explained.

Sect 9. *The* METHOD *of keeping a* JOURNAL *at sea; and how to correct it, by making proper allowances for the* leeway, variation, *&c.*

1. LEE-WAY is the angle that the rhomb line, upon which the ship endeavours to sail, makes with the rhomb she really sails upon. This is occasioned by the force of the wind or surge of the sea, when she lies to the windward, or is close hauled, which causes her to fall off and glide side-ways from the point of the compass she capes at. Thus let NESW (No. 31.) represent the compass; and suppose a ship at C capes at, or endeavours to sail upon, the rhomb C*a*; but by the force of the wind, and surge of the sea, she is obliged to fall off, and make her way good upon the rhomb C*b*; then the angle *a*C*b* is the lee-way; and if that angle be equal to one point, the ship is said to make one point lee way; and if equal to two points, the ship is said to make two points lee way, *&c.*

2. The quantity of this angle is very uncertain, because some ships, with the same quantity of sail, and with the same gale, will make more lee-way than others; it depending much upon the mould and trim of the ship, and the quantity of water that she draws. The common allowances that are generally made for the lee-way, are as follow.

1. If a ship be close hauled, has all her sails set, the water smooth, and a moderate gale of wind, she is then supposed to make little or no lee-way.

2. If it blow so fresh as to cause the small sails be handed, it is usual to allow one point.

3. If it blow so hard that the top sails must be close reeft, then the common allowance is two points for lee-way.

4. If one top sail must be handed, then the ship is supposed to make between two and three points lee way.

5. When both top-sails must be handed, then the allowance is about four points for lee-way.

6. If blows so hard, as to occasion the fore-course to be handed, the allowance is between $5\frac{1}{2}$ and 6 points.

7. When both main and fore-courses must be handed, then 6 or $6\frac{1}{2}$ points are commonly allowed for lee-way.

8. When the mizen is handed, and the ship is trying a hull, she is then commonly allowed about 7 points for lee-way.

3 Though these rules are such as are generally made use of, yet since the lee-way depends much upon the mould and trim of the ship, it is evident that they cannot exactly serve to every ship; and therefore the best way is to find it by observation: Thus, let the ship's wake be set by a compass in the poop, and the opposite rumb is the true course made good by the ship; then the difference between this and the course given by the compass in the bittacle, is the lee-way required. If the ship be within sight of land; then the lee way may be exactly found by observing a point on the land which continues to bear the same way, and the distance between the point of the compass it lies upon and the point the ship capes at will be the lee-way. Thus suppose a ship at C, is lying up NW*b*, towards A; but instead of keeping that course, she is carried on the NNE line CB, and consequently the point B continues to bear the same way from the ship: Here it is evident, that the angle ACB, or the distance between the N*b*W line that the ship capes at, and the NNE line that the ship really sails upon, will be the lee-way.

4. Having the course steered, and the lee-way, given; we may from thence find the true course by the following method, *viz.* Let your face be turned directly to the windward; and if the ship have her larboard tacks on board, count the lee way from the course steered towards the right hand; but if the starboard tacks be on board, then count it from the course steered towards the left hand. Thus, suppose the wind at north, and the ship lies up within 6 points of the wind, with her larboard tacks on board, making one point lee-way; here it is plain, that the course steered is ENE, and the true course E*b*N; also suppose the wind is at NNW, and the ship lies up within $6\frac{1}{2}$ points of the wind with her starboard tack on board, making $1\frac{1}{2}$ point lee way; it is evident that the true course, in this case, is WSW.

5. We have shewed, in the last section, how to find the variation of the compass; and from what has been said there, we have this general rule for finding the ship's true course, having the course steered and the variation given, *viz.* Let your face be turned towards the point of the compass upon which the ship is steered; and if the variation be easterly, count the quantity of it from the course steered towards the right hand; but if westerly, towards the left hand; and the course thus found is the true course steered. Thus, suppose the course steered is N*b*E, and the variation one point easterly; then the true course steered will be NNE: Also suppose the course steered is NE*b*E, and the variation one point westerly; then in this case, the true course will be NE; and so of others.

Hence, by knowing the lee-way variation, and course steered, we may from thence find the ship's true course; but if there be a current under foot, then that must be tried, and proper allowances made for it, as has been shown in the section concerning *Currents*, from thence to find the true course.

6. After making all the proper allowances for finding the ship's true course, and making as just an estimate of the distance as we can; yet by reason of the many accidents that attend a ship in a day's running, such as different rates of sailing between the times of heaving the log, the

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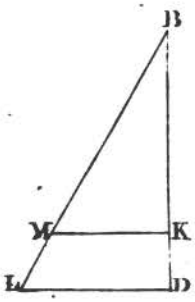
N. 15.



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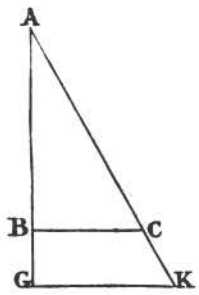

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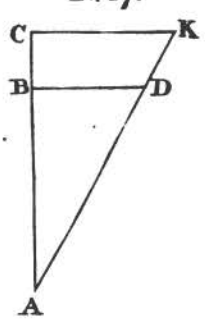

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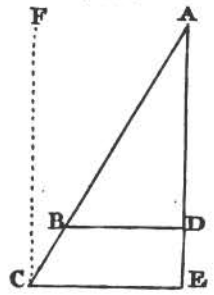

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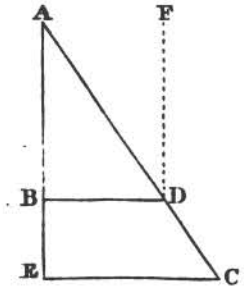

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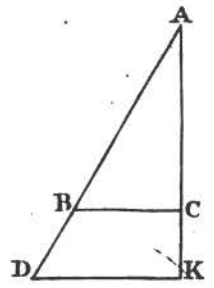

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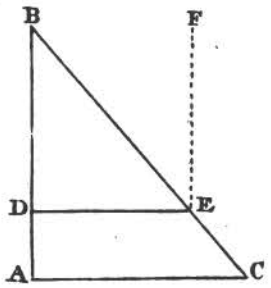

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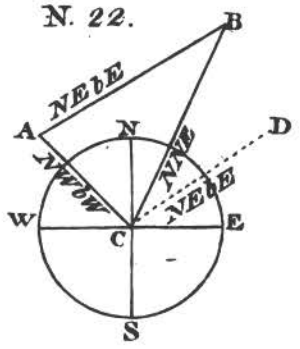

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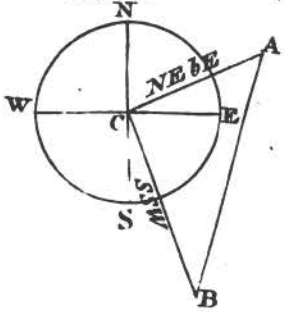

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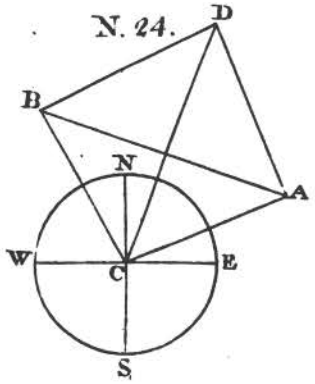

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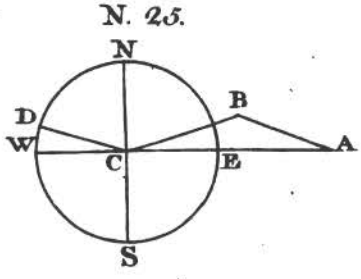

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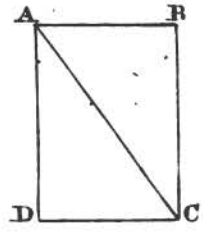

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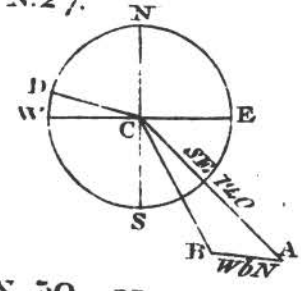

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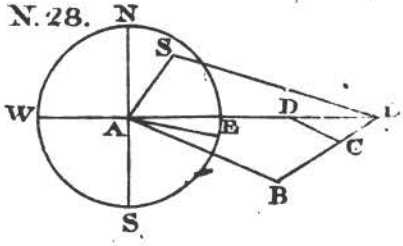

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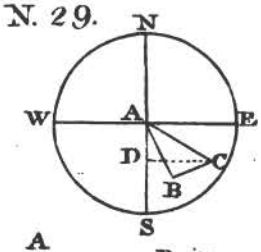

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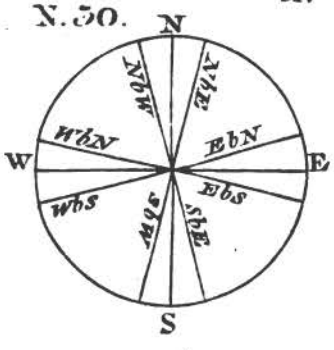

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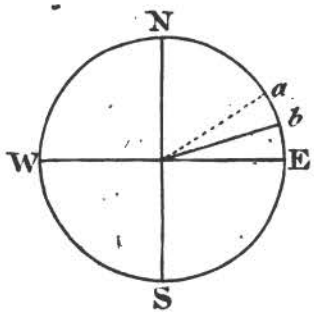

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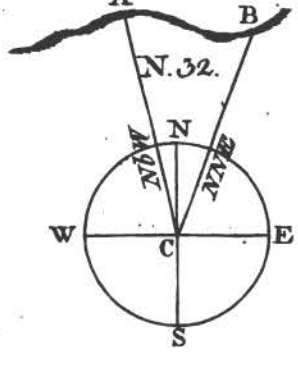

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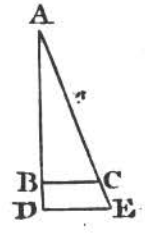

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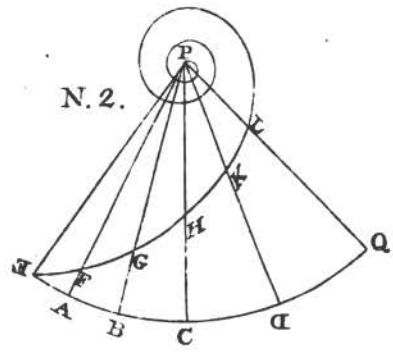

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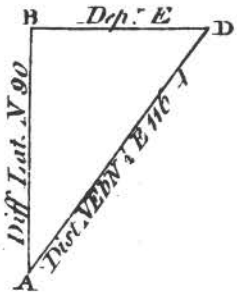

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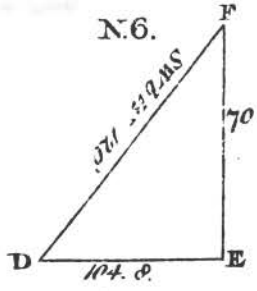

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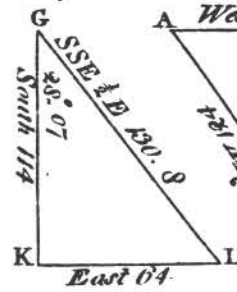

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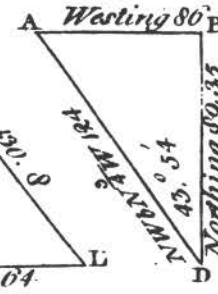

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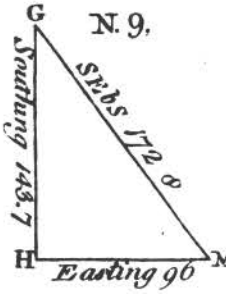

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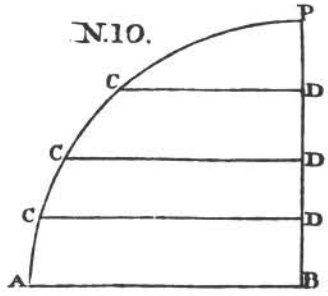

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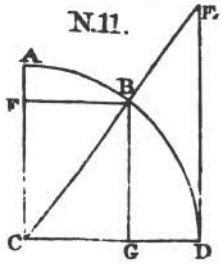

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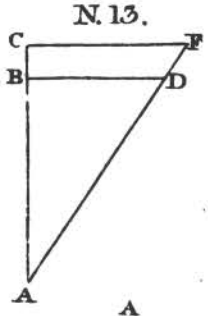

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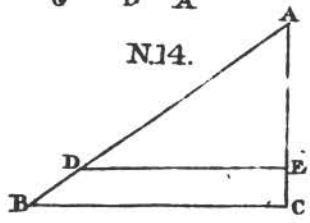

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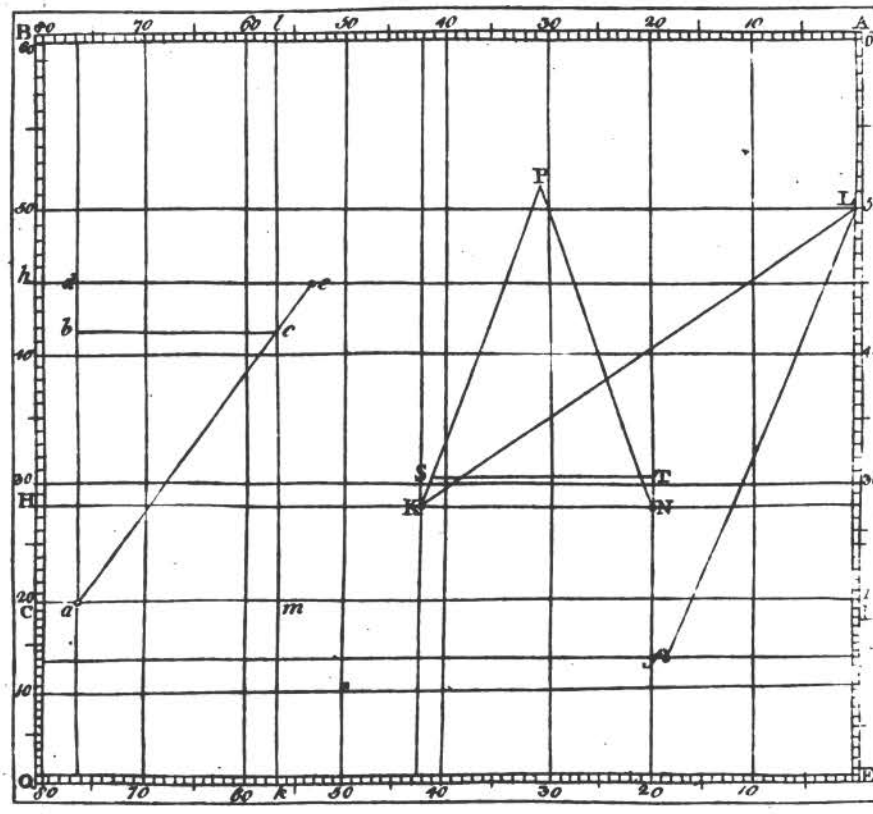

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the want of due care at the helm by not keeping her ſteady, but ſuffering her to yaw and fall off; ſudden ſtorms, when no account can be kept, *&c.*; the latitude by account frequently differs from the latitude by obſervation; and when that happens, it is evident there muſt be ſome error in the reckoning; to diſcover which, and where it lies, and alſo how to correct the reckoning, you may obſerve the following rules.

1ſt, If the ſhip ſail near the meridian, or within 2 or $2\frac{1}{2}$ points thereof; then if the latitude by account diſagrees with the latitude by obſervation, it is moſt likely that the error lies in the diſtance run; for it is plain that in this caſe it will require a very ſenſible error in the courſe to make any conſiderable error in the difference of latitude, which cannot well happen if due care be taken at the helm, and proper allowances be made for the lee-way, variation, and currents. Conſequently if the courſe be pretty near the truth, and the error in the diſtance run regularly through the whole, we may, from the latitude obtained by obſervation, correct the diſtance and departure by account, by the following analogies, *viz.*

As the difference of latitude by account
is to the true difference of latitude,
ſo is the departure by account
to the true departure,
and ſo is the direct diſtance by account
to the true direct diſtance.

The reaſon of this is plain: for let AB (No. 93.) denote the meridian of the ſhip at A, and ſuppoſe the ſhip ſails upon the rhomb AE near the meridian, till by account ſhe is found in C, and conſequently her difference of latitude by account is AB; but by obſervation ſhe is found in the parallel ED, and ſo her true difference of latitude is AD, her true diſtance AE, and her true departure DE; then ſince the triangles ABC ADE are ſimilar, it will be AB : AD :: BC : DE, and AB : AD :: AC : AE.

EXAMPLE. Suppoſe a ſhip from the latitude of 45° 20' north, after having ſailed upon ſeveral courſes near the meridian for 24 hours, her difference of latitude is computed to be upon the whole 95 miles ſoutherly, and her departure 34 miles eaſterly; but by obſervation ſhe is found to be in the latitude of 43° 10' north, and conſequently her true difference of latitude is 130 miles ſoutherly; then for the true departure, it will be, As the difference of latitude by account 95 is to the true difference of latitude 130, ſo is the departure by account 34 to the true departure 46.52, and ſo is the diſtance by account 100.9 to the true diſtance 138.

2dly, If the courſes are for the moſt part near the parallel of eaſt and weſt, and the direct courſe be within $5\frac{1}{2}$ or 6 points of the meridian; then if the latitude by account differs from the obſerved latitude, it is moſt probable that the error lies in the courſe, or diſtance, or perhaps both; for in this caſe it is evident, the departure by account will be very nearly true; and thence by the help of this, and the true difference of latitude, may the true courſe and direct diſtance be readily found by *Caſe* 4. *of Plain Sailing*.

EXAMPLE. Suppoſe a ſhip from the latitude of 43° 50' north, after having ſailed upon ſeveral courſes near the parallel of eaſt and weſt, for the ſpace of 24 hours, is found by dead reckoning to be in the latitude of 42° 45' north, and to have made 160 miles of weſting; but by a good obſervation the ſhip is found to be in the latitude of 42° 35' north: Required the true courſe, and direct diſtance ſailed.

With the true difference of latitude 75 miles, and departure 160 miles, we ſhall find (by *Caſe* 4. *of Plain Sailing*) the true courſe to be S 64° 53' W, and the direct diſtance 176.7 miles.

3dly, If the courſes are for the moſt part near the middle of the quadrant, and the direct courſe within 2 and 6 points of the meridian; then the error may be either in the courſe, or in the diſtance, or in both, which will cauſe an error both in the difference of latitude and departure; to correct which, having found the true difference of latitude by obſervation, with this, and the direct diſtance by dead reckoning, find a new departure (by *Caſe* 3. *of Plain Sailing*;) then half the ſum of this departure, and that by dead reckoning, will be nearly equal to the true departure; and conſequently with this, and the true difference of latitude, we may (by *Caſe* 4. *of Plain Sailing*) find the true courſe and diſtance.

EXAMPLE. Suppoſe a ſhip from the latitude of 44° 38' north, ſails between ſouth and eaſt upon ſeveral courſes, near the middle of the quadrant, for the ſpace of 24 hours, and is then found by dead reckoning to be in the latitude of 42° 15' north, and to have made of eaſting 136 miles; but by obſervation ſhe is found to be in the latitude of 42° 04' north: Required her true courſe and diſtance.

With the true diſtance of latitude 154 miles, and the direct diſtance by dead reckoning 197.4, you will find (by *Caſe* 3. *of Plain Sailing*) the new departure to be 123.4, and half the ſum of this and the departure by dead reckoning will be 123.7 the true departure; then with this, and the true difference of latitude, you will find (by *Caſe* 4. *of Plain Sailing*) the true courſe to be S 39° 00' E, and the direct diſtance 198.2 miles.

7. In keeping a ſhip's reckoning at ſea, the common method is to take from the log-board the ſeveral courſes and diſtances ſteemed by the ſhip laſt 24 hours, and to tranſfer theſe together with the moſt remarkable occurrences into the log-book, into which alſo are inſerted the courſes corrected, and the difference of latitude and difference of longitude made good upon each; then the whole day's work being finiſhed in the log-book, if the latitude by account agree with the latitude by obſervation, the ſhip's place will be truly determined; if not, then the reckoning muſt be corrected according to the preceding rules, and placed in the journal.

The form of the Log-book and Journal, together with an example of 2 days work, you have here ſubjoined.

Note, To expreſs the days of the week, they commonly uſe the characters by which the ſun and planets are expreſſed, *viz.* ☉ denotes *Sunday*. ☾ *Monday*, ♂ *Tueſday*, ☿ *Wedneſday*, ♃ *Thurſday*, ♀ *Friday*, and ♄ denotes *Saturday*.

The FORM of the

LOG-BOOK,

With the Manner of working Days Works at SEA.

The Log-Book.

H.	K.	½K.	Courſes.	Winds.	Obſervations and Accidents.)— Day of——
					Fair weather, at four this afternoon I took my departure from the Lizard, in the latitude of 5° 00' north, it bearing N N E, diſtance five leagues.
1				North	
2					
3					
4					
5	7		S W b S	N b E	
6	7				
7	7	1			
8	7	1			
9	6				
10	6				
11	6		S S W	E b S	The gale increaſing and being under all our ſails.
12	6	1			
1	6	1			After three this morning, frequent ſhowers with thick weather till near noon.
2	6	1	S W b W	N N E	
3	6	1			
4	7				
5	7	1			
6	8				
7	8				
8	8		S W	E N E	The variation I reckon to be one point weſterly.
9	8	1			
10	9				
11	8	1	S W ½ W	N E b E	
12	8				

The Log-Book.

Courſes Correct.	Diſt.	Diff. Lat.		Diff. long.	
		N	S	E	W
S S W	50		46.2		29.4
S b W	19		18.6		5.5
S W	49		29.7		45.5
S W b S	24.5		20.2		20.0
S W ½ S	25.5		19.5		24.6
			144.2		125.0

Hence the ſhip, by account, has come to the latitude of 47° 46' north, and has differed her longitude 2° 5' weſterly; ſo this day I have made my way good S 31° 31' W, diſtance 157.4 miles.

At noon the Lizard bore from me N 31° 31' E, diſtance 157.4 miles; and having obſerved the latitude, I found it agreed with the latitude by account.

The

The Log Book.

H.	K.	½K.	Courſes. Winds.	Obſervations and Accidents. ♂— Day of—
1	2		SSW W	This 24 hours,
2	1	1	Handed the main	ſtrong gale of wind
3	1	1	and fore courſes,	and variable.
4	1	1	lee-way 6 points	
5	1	1		
6	1			
7	1			
8	1	1	The wind increaſ-	
9	1		ing, we tried a	
10	1		hull, lee-way 7	The variation I
11	1		points.	judge to be 1
12	1	1		point weſt.
1	2		SW*b*W NW*b*W	
2	1	1	Set main-ſail, lee-	
3	1		way 4 ½ points.	
4	1			
5	1			
6	1	1		
7	1			
8	4		S*b*E SW*b*W	
9	4	1	Set fore-ſail, lee-	
10	4	1	way 3 points.	
11	5			Lat. by obſerva-
12	4	1		tion, 47° 06′ N.

The Log-Book.

Courſes Correct.	Diſt.	Diff. Lat.		Diff. Long.	
		N	S	E	W
S E *b* E	32.5		17.8	37.7	
E S E	6		2.3	10.6	
S ½ E	9		8.9	1.3	
			29.0	49.6	

Hence the ſhip, by account, has come to the latitude of 47° 17′ north, and has differed her longitude 49′ eaſterly; conſequently ſhe has got 1° 16′ to the weſtward of the Lizard, and has made her way good the laſt 24 hours 849° 08′ E, diſtance 44.3 miles.

At noon the Lizard bore from me north 17° 7′ eaſt, diſtance 170.6 miles.

This day I had an obſervation, and found the latitude by account to diſagree with the latitude by obſervation by 11 minutes, I being ſo much further to the ſouthward than by dead reckoning, which by the third of the preceding rules I correct as in the Journal.

A JOURNAL from the Lizard towards Jamaica in the ſhip Neptune, *J. M.* commander.

Week Days	Months Years	Month Days	Winds	Direct Courſe	Diſt. Miles	Latitude Correct	Whole Diff. Long. made	Bearing and Diſt. from the Lizard.	Remarkable Obſervations and Accidents.
D			N *b* E E *b* S N N E E N E N E *b* E	S 31, 31 W	157.4	47°, 46′	2°, 5′ W	At noon the Lizard bore N. 31° 31′ E. Diſt. 157.4 miles.	Fair weather at four *P. M.* I took my departure from the Lizard, it bearing N N E diſtance 5 leagues.
♂			Weſt N W *b* W S W *b* W	S 34, 01 E	48.2	47°, 06′	1°, 35′ W	At noon the Lizard bore S. 17° 55′ W. Diſt. 183 miles.	Strong gales of wind and variable.

NAUMACHIA,

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NAUMACHIA, in antiquity, a ſhew or ſpectacle among the ancient Romans, repreſenting a ſea-fight.

NAUMBURG, a city of Germany, the capital of the county of Sax Naumburg, in Upper Saxony, ſituated in E. long. 12°, N. lat. 51° 15'.

NAUSEA, in medicine, a reaching, or propenſity and endeavour to vomit, ariſing from a loathing of food, excited by ſome viſcous humour that irritates the ſtomach.

NAUTICAL PLANISPHERE, a deſcription of the terreſtrial globe upon a plane for the uſe of mariners, more uſually called chart.

NAUTILUS, in zoology, a genus belonging to the order of vermes teſtacea. The ſhell conſiſts of one ſpiral valve, divided into ſeveral apartments by partitions. There are 17 ſpecies, principally diſtinguiſhed by peculiarities in their ſhells.

NAVY, the fleet or ſhipping of a prince or ſtate.

The management of the Britiſh navy-royal, under the lord high admiral of Great Britain, is entruſted to principal officers and commiſſioners of the navy, who hold their places by patent. The principal officers of the navy are four, *viz.* the treaſurer, whoſe buſineſs it is to receive money out of the exchequer, and to pay all the charges of the navy, by warrant from the principal officers: comptroller, who attends and comptrols all payment of wages, is to know the rates of ſtores, to examine and audite all accounts, *&c.*: ſurveyor, who is to know the ſtates of all ſtores, and ſee wants ſupplied; to eſtimate repairs, charge boatſwains, *&c.* with what ſtores they receive, and at the end of each voyage to ſtate and audite accounts: clerk of the acts, whoſe buſineſs it is to record all orders, contracts, bills, warrants, *&c.*

The commiſſioners of the navy are five: the firſt executes that part of the comptroller's duty which relates to the comptrolling the victuallers accounts; the ſecond, another part of the ſaid comptroller's duty, relating to the account of the ſtore-keepers of the yard; the third has the direction of the navy at the port of Portſmouth; the fourth has the ſame at Chatham; and the fifth, at Plymouth.

There are alſo other commiſſioners at large, the number more or leſs according to the exigencies of public affairs; and ſince the increaſe of the royal navy, theſe have ſeveral clerks under them, with ſalaries allowed by the king.

The victualling of the royal navy hath formerly been undertaken by contract; but is now managed by commiſſioners, who hold their office on Tower-hill, London.

The navy-office is where the whole buſineſs concerning the navy is managed by the principal officers and commiſſioners.

The royal navy of Great Britain is now in a very flouriſhing ſtate; having been diligently kept up in late reigns, as the natural ſtrength of the kingdom. When it is complete, it is divided into three ſquadrons, diſtinguiſhed by the different colours of the flags carried by the reſpective admirals belonging to the ſame.

NAXIA, or NIXIA, one of the iſlands of the Archipelago, about an hundred miles in circumference, ſituated in E. long. 26°, and N. lat. 36° 30'.

NAZARENES, in church hiſtory, a name originally given to all Chriſtians in general, on account that Jeſus Chriſt was of the city of Nazareth; but afterwards reſtrained to a ſect of heretics, whoſe religion conſiſted of a ſtrange jumble of Judaiſm and Chriſtianity, obſerving at the ſame time the Moſaical law and the ſeveral rites of the Chriſtian religion.

NAZARITES, among the Jews, perſons who either of themſelves, or by their parents, were dedicated to the obſervation of nazariteſhip. They were of two ſorts: namely, ſuch as were bound to this obſervance for only a ſhort time, as a week or month; or thoſe who were bound to it all their lives. All that we find peculiar in the latter's way of life, is, that they were to abſtain from wine and all intoxicating liquors, and never to ſhave or cut off the hairs of their heads. The firſt ſort of Nazarites were moreover to avoid all defilement; and if they chanced to contract any pollution before the term was expired, they were obliged to begin afreſh. Women as well as men might bind themſelves to this vow.

NEALED, among ſeamen, is uſed when the ſounding is deep water cloſe to the ſhore; as alſo when the ſhore is ſandy, clayey, ouzy, or foul and rocky ground.

NEAPED. When a ſhip wants water ſo that ſhe cannot get out of the harbour, off the ground, or out of the dock, the ſeamen ſay ſhe is neaped, or beneaped.

NEATH, a town of Glamorganſhire, in ſouth Wales, ſituated on the river Neath, near the Briſtol channel, twenty-eight miles north weſt of Landaff.

NEBULY, or NEBULEE, in heraldry, is when a coat is charged with ſeveral little figures, in form of words, running within one another, or when the outline of a bordure, ordinary, *&c.* is indented or waved, as repreſented in Plate CXXXIV. fig. 3.

NECESSARY, in a philoſophical ſenſe, that which cannot but be, or cannot be otherwiſe.

NECESSITY, whatever is done by a neceſſary cauſe, or a power that is irreſiſtible, in which ſenſe it ſtands oppoſed to freedom. See METAPHYSICS.

NECK, in anatomy, is that ſlender part ſituated between the head and trunk of the body. See ANATOMY.

NECKAR, a river of Germany, which riſes in the ſouth part of the circle of Swabia, and falls into the Rhine at Manheim.

NECROMANCY, a ſpecies of divination, performed by raiſing the dead, and extorting anſwers from them. See DIVINATION.

NECTAR, among ancient poets, the drink of the fabulous deities of the heathens, in contradiſtinction from their ſolid food, which was called ambroſia.

NECTARINE. See PERSICA.

NECTARIUM, among botaniſts. See BOTANY, p. 637.

NECYDALIS, in zoology, a genus of inſects belonging to the order of coleoptera. The feelers are ſetaceous; the elytra are ſhorter and narrower than the wings; and the

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the tail is ſimple. There are eleven ſpecies, chiefly diſtinguiſhed by the ſize and figure of the elytra.

NEEDHAM, a market-town of Suffolk, ſituated on the river Orwel, eight miles north-weſt of Ipſwich.

NEEDLE, a very common little inſtrument or utenſil, made of ſteel, pointed at one end, and pierced at the other, uſed in ſewing embroidery, tapeſtry, *&c.*

Needles make a very conſiderable article in commerce, though there is ſcarce any commodity cheaper, the conſumption of them being almoſt incredible. The ſizes are from n° 1. the largeſt, to n° 25. the ſmalleſt. In the manufacture of needles, German and Hungarian ſteel are of moſt repute.

In the making of them, the firſt thing is to paſs the ſteel through a coal fire, and under a hammer, to bring it out of its ſquare figure into a cylindrical one. This done, it is drawn through a large hole of a wire-drawing iron, and returned into the fire, and drawn through a ſecond hole of the iron, ſmaller than the firſt, and thus ſucceſſively from hole to hole, till it has acquired the degree of fineneſs required for that ſpecies of needles, obſerving every time it is to be drawn, that it be greaſed over with lard, to render it more manageable. The ſteel thus reduced to a fine wire, is cut in pieces of the length of the needles intended. Theſe pieces are flatted at one end on the anvil, in order to form the head and eye; they are then put into the fire, to ſoften them farther; and thence taken out and pierced at each extreme of the flat part on the anvil, by force of a puncheon of well tempered ſteel, and laid on a leaden block to bring out, with another puncheon, the little piece of ſteel remaining in the eye. The corners are then filed off the ſquare of the heads, and a little cavity filed on each ſide of the flat of the head; this done, the point is formed with a file, and the whole filed over; they are then laid to heat red hot on a long flat narrow iron, crooked at one end, in a charcoal fire, and when taken out thence are thrown into a baſon of cold water to harden. On this operation a good deal depends; too much heat burns them, and too little leaves them ſoft; the medium is learned by experience. When they are thus hardened, they are laid in an iron ſhovel on a fire more or leſs briſk in proportion to the thickneſs of the needles; taking care to move them from time to time. This ſerves to temper them, and take off their brittleneſs; great care here too muſt be taken of the degree of heat. They are then ſtraightened one after another with the hammer, the coldneſs of the water uſed in hardening them having twiſted the greateſt part of them.

The next proceſs is the poliſhing them. To do this, they take twelve or fifteen thouſand needles, and range them in little heaps againſt each other on a piece of new buckram ſprinkled with emery-duſt. The needles thus diſpoſed, emery duſt is thrown over them, which is again ſprinkled with oil of olives; at laſt the whole is made up into a roll, well bound at both ends. This roll is then laid on a poliſhing table, and over it a thick plank loaden with ſtones, which two men work backwards and forwards a day and a half, or two days, ſucceſſively, by which means the roll thus continually agitated by the weight and motion of the plank over it, the needles withinſide being rubbed againſt each other with oil and emery are inſenſibly poliſhed. After poliſhing, they are taken out, and the filth waſhed off them with hot water and ſoap: they are then wiped in hot bran, a little moiſtened, placed with the needles in a round box, ſuſpended in the air by a cord, which is kept ſtirring till the bran and needles be dry. The needles thus wiped in two or three different brans, are taken out and put in wooden veſſels, to have the good ſeparated from thoſe whoſe points or eyes have been broke either in poliſhing or wiping; the points are then all turned the ſame way, and ſmoothed with an emery-ſtone turned with a wheel. This operation finiſhes them, and there remains nothing but to make them into packets of two hundred and fifty each.

Magnetical NEEDLE, in navigation, a needle touched with a loadſtone, and ſuſtained on a pivot or centre; on which playing at liberty, it directs itſelf to certain points in or under the horizon. See NAVIGATION.

NEEDLE FISH. See SYNGNATHUS.

NEEDLES, two capes, or head-lands, at the weſt end of the iſle of Wight, which is very difficult to paſs on account of the ſands and rocks.

NEFASTI DIES, in Roman antiquity, an appellation given to ſuch days wherein it was not allowed to adminiſter juſtice, uſually marked in the kalendar by N. or N. P. *i. e.* nefaſtus prima, when only nefaſtus for the firſt part of it.

NEGAPATAN, a port-town of the hither India, ſituated on the coaſt of Coromandel: E. long. 79°, N. lat. 11° 15'.

NEGATION, in logic, an act of the mind affirming one thing to be different from another; as, that the ſoul is not matter.

NEGATIVE, in general, ſomething that implies a negation: thus we ſay, negative quantities, negative ſigns, negative powers, *&c.* See METAPHYSICS and LOGIC.

NEGOMBO, a port-town on the weſt coaſt of the iſle of Ceylon, in the Indian ocean, ſubject to the Dutch: E. long. 78°, N. lat. 7° 25'.

NEGRAIS, a port-town of Pegu, in the further India, ſituated on the weſt ſide of the bay of Bengal: E. lon. 92° 30', N. lat. 17°.

NEGRIL POINT, the moſt weſterly promontory of the iſland of Jamaica.

NEGROES, properly the inhabitants of Nigritia in Africa, alſo called blacks and moors; but this name is now given to all the blacks.

The origin of the negroes, and the cauſe of this remarkable difference from the reſt of the human ſpecies, has much perplexed the naturaliſts. Mr. Boyle has obſerved, that it cannot be produced by the heat of the climate: for though the heat of the ſun may darken the colour of the ſkin, yet experience does not ſhew that it is ſufficient to produce a new blackneſs, like that of the negroes.

In Africa itſelf, many nations of Æthiopia are not black, nor were there any blacks originally in the Weſt Indies. In many parts of Aſia, under the ſame parallel with the African region, inhabited by blacks,

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the people are but tawny. He adds, that there are negroes in Africa, beyond the ſouthern tropic; and that a river ſometimes parts nations, one of which is black and the other only tawny. Dr Barriere alledges that the gall of negroes is black, and being mixed with their blood is depoſited between their ſkin and ſcarf-ſkin. However, Dr Mitchel of Virginia, in the philoſophical tranſactions, n° 476, has endeavoured by many learned arguments to prove, that the influence of the ſun in hot countries, and the manner of life of their inhabitants, are the remote cauſes of the colour of negroes, indians, *&c.* and indeed it would be a ſtrong confirmation of his doctrine, if we would ſee any people, originally white, become black and woolly by tranſplantation, or *vice verſa*.

Negroes are brought from Guinea, and other coaſts of Africa, and ſent into the colonies in America, to cultivate tobacco, ſugar, indigo, *&c.* and in Mexico and Peru, to dig in the mines; and this commerce, which is ſcarce defenſible on the foot either of religion or humanity, is now carried on by all the nations that have ſettlements in the Weſt Indies. Thoſe negroes make the beſt ſlaves who are brought from Angola, Senegal, Cape Verd, the river Gambia, the kingdoms of Joloffes, Daniel, Galland, *&c.*

There are various ways of procuring them: ſome, to avoid famine, ſell themſelves, their wives and children, to their princes, or other great men; others are made priſoners of war; and great numbers are ſeized in excurſions made for that very purpoſe by the petty princes upon one another's territories, in which it is uſual to ſweep away all without diſtinction of age or ſex.

NEGROES-ISLAND, one of the Philippine iſlands, in the Indian ocean, ſubject to Spain; ſo called, becauſe moſt of the inhabitants are blacks: E. long. 120°, N. lat. 10°.

NEGROLAND, or NIGRITIA, a country of Africa, which lies between 18° weſt and 15° eaſt longitude, and between 10° and 20° of north latitude, the great river Niger running through it. It is bounded by Zaara, or the deſart, on the north, by unknown countries on the eaſt, by Guinea on the ſouth, and by the Atlantic ocean on the weſt.

NEGROPONT, or EGRIPOS, the capital of the iſland of Negropont, anciently called Euboea, ſituated in the Archipelago, on the weſt ſide of the iſland; where the ſtrait is ſo narrow, that it is joined to the continent by a bridge: E. lon. 24° 30', N. lat. 38° 30'.

NEHEMIAH, a canonical book of the Old Teſtament ſo called from the name of its author. Nehemiah was born in Babylon, during the captivity, and ſucceeded Ezra in the government of Judah and Jeruſalem. He was a Jew, and was promoted to the office of cup-bearer to Artaxerxes Longimanus king of Perſia; when the opportunities he had of being daily in the king's preſence, together with the favour of Eſther the queen, procured him the favour of being authorized to repair and fortify the city of Jeruſalem, in the ſame manner as it was before its deſtruction by the Babylonians. On his going to Jeruſalem, he finiſhed the rebuilding of the walls in fifty-two days, and dedicated the gates of the city with great ſolemnity. He then reformed ſome abuſes which had crept in among his countrymen, particularly the extortion of the uſurers, by which the poor were ſo oppreſſed as to be forced to ſell their lands and children for ſupport: after which he returned to Perſia, and came back again with a new commiſſion, by virtue of which he regulated every thing relating both to the ſtate and religion of the Jews. The hiſtory of theſe tranſactions is the ſubject of this book.

NELLENBURG, a city of Swabia, in Germany, capital of a county of the ſame name, ſituated fifteen miles north of Conſtance.

NEMÆA, a town in the Morea, thirty miles ſouth of Corinth, where the ancient Nemæan games were celebrated.

NEMÆAN GAMES, were ſo called from Nemæa, a village between the cities of Cleonæ and Philus, where they were celebrated every third year. The exerciſes were chariot-races, and all the parts of the pentathlum. Theſe games were inſtituted in memory of Opheltes, or Archemorus, the ſon of Euphetes and Creuſa, and nurſed by Hypſipyle; who leaving him in a meadow, while ſhe went to ſhew the beſiegers of Thebes a fountain, at her return found him dead, and a ſerpent twined about his neck; whence the fountain, before called Langia, was named Archemorus; and the captains, to comfort Hypſipyle, inſtituted theſe games. Others aſcribe their inſtitution to Hercules, after his victory over the Nemæan lion.

NEMOURS, a city in the iſle of France, forty-two miles ſouth of Paris: E. long. 2° 45', N. lat. 48° 17'.

NEOMENIA, or NOUMENIA, a feſtival of the ancient Greeks, at the beginning of every lunar month, which was, as the name imports, obſerved upon the day of the new moon, in honour of all the gods, but eſpecially Apollo, who was called Neomenios; becauſe the ſun is the fountain of light, and whatever diſtinction of times and ſeaſons may be taken from other planets, yet they are all owing to him as the original of thoſe borrowed rays by which they ſhine.

NEOPHYTES, *new plants*, a name given by the ancient Chriſtians to thoſe heathens who had newly embraced the faith; ſuch perſons being conſidered as regenerated, or born anew by baptiſm. The term neophytes has been alſo uſed for new prieſts, or thoſe juſt admitted into orders, and ſometimes for the novices in monaſteries. It is ſtill applied to the converts made by the miſſionaries among the infidels.

NEOTTIA, in botany. See OPHRYS.

NEPA, in zoology, a genus of inſects belonging to the order of hemiptera. The roſtrum is inflected; the antennæ are ſhorter than the thorax; and the hind-feet are hairy, and fitted for ſwimming. There are ſeven ſpecies.

NEPENTHES, in botany, a plant of the gynandria tetrandria claſs. The calix conſiſts of four ſegments; it has no corolla; and the capſule has four cells. There is but one ſpecies, a native of Ceylon.

NEPER's RODS, or BONES, an inſtrument invented by

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Fig. 1. Nepers Rods

No. 1

1	1	2	3	4	5	6	7	8	9	0
2	2	4	6	8	10	12	14	16	18	0
3	3	6	9	12	15	18	21	24	27	0
4	4	8	12	16	20	24	28	32	36	0
5	5	10	15	20	25	30	35	40	45	0
6	6	12	18	24	30	36	42	48	54	0
7	7	14	21	28	35	42	49	56	63	0
8	8	16	24	32	40	48	56	64	72	0
9	9	18	27	36	45	54	63	72	81	0

No. 2

1	4	7	6	8
2	8	14	12	16
3	12	21	18	24
4	16	28	24	32
5	20	35	30	40
6	24	42	36	48
7	28	49	42	56
8	32	56	48	64
9	36	63	54	72

Fig. 2. Noc turnal

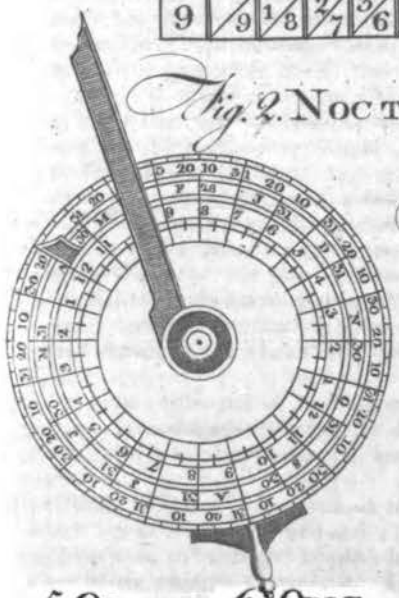
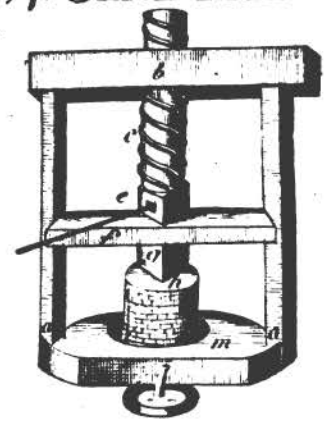
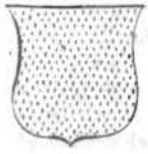


Fig. 3. Nebuly

Fig. 4. Olive Press



5 Or



6 Orle

7 Pale

8 Palisse

9 Pall

10 Paly

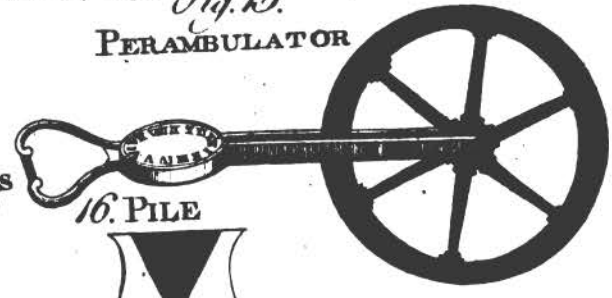
11 Party per Pale.

12 Passion Cross

13 Patee.

14 Patriarchal Cross

Fig. 15. Perambulator



16. Pile

C. & B. Sc.

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by J. Neper, baron of Merchiſton, in Scotland, whereby the multiplication and diviſion of large numbers are much facilitated.

As to the conſtruction of NEPER'S RODS: ſuppoſe the common table of multiplication to be made upon a plate of metal, ivory, or paſte-board, and then conceive the ſeveral columns (ſtanding downwards from the digits on the head) to be cut aſunder; and theſe are what we call Neper's rods for multiplication. But then there muſt be a good number of each; for as many times as any figure is in the multiplicand, ſo many rods of that ſpecies (*i. e.* with that figure on the top of it) muſt we have; though ſix rods of each ſpecies will be ſufficient for any example in common affairs: there muſt alſo be as many rods of 0's.

But before we explain the way of uſing theſe rods, there is another thing to be known, *viz.* that the figures on every rod are written in an order different from that in the table. Thus, the little ſquare ſpace or diviſion in which the ſeveral products of every column are written, is divided into two parts by a line acroſs from the upper angle on the right to the lower on the left; and if the product is a digit, it is ſet in the lower diviſion; if it has two places, the firſt is ſet in the lower, and the ſecond in the upper diviſion; but the ſpaces on the top are not divided; alſo there is a rod of digits, not divided, which is called the index rod, and of this we need but one ſingle rod. See the figure of all the different rods, and the index, ſeparate from one another, in Plate CXXXIV. fig 1.

Multiplication by NEPER'S RODS. Firſt lay down the index rod; then on the right of it ſet a rod whoſe top is the figure in the higheſt place of the multiplicand; next to this again, ſet the rod whoſe top is the next figure of the multiplicand; and ſo on in order, to the firſt figure. Then is your multiplicand tabulated for all the nine digits; for in the ſame line of ſquares ſtanding againſt every figure of the index rod, you have the product of that figure, and therefore you have no more to do but to tranſfer the products and ſum them. But in taking out theſe products from the rods, the order in which the figures ſtand obliges you to a very eaſy and ſmall addition; thus, begin to take out the figure in the lower part, or unit's place, of the ſquare of the firſt rod on the right; add the figure in the upper part of this rod to that in the lower part of the next, and ſo on, which may be done as faſt as you can look on them. To make this practice as clear as poſſible, take the following example.

Example: To multiply 4768 by 185. Having ſet the rods together for the number 4768 (*ibid* n° 2.) againſt 5 in the index, I find this number, by adding according to the rule, - - - 23840

Againſt 8, this number - - -	38144
Againſt 3, this number - - -	14304
Total product	1835680

To make the uſe of the rods yet more regular and eaſy, they are kept in a flat ſquare box, whoſe breadth is that of ten rods, and the length that of one rod, as thick as to hold ſix (or as many as you pleaſe) the capacity of the box being divided into ten cells for the different ſpecies of rods. When the rods are put up in the box (each ſpecies in its own cell diſtinguiſhed by the firſt figure of the rod ſet before it on the face of the box near the top) as much of every rod ſtands without the box as ſhews the firſt figure of that rod; alſo upon one of the flat ſides without and near the edge, upon the left hand, the index rod is fixed; and along the foot there is a ſmall ledge, ſo that the rods when applied are laid upon this ſide, and ſupported by the ledge, which makes the practice very eaſy; but in caſe the multiplicand ſhould have more than nine places, that upper face of the box may be made broader. Some make the rods with four different faces, and figures on each for different purpoſes.

Diviſion by NEPER'S RODS. Firſt tabulate your diviſor; then you have it multiplied by all the digits, out of which you may chuſe ſuch convenient diviſors as will be next leſs to the figures in the dividend, and write the index anſwering in the quotient, and ſo continually till the work is done. Thus 2179788, divided by 6123, gives in the quotient 356.

Having tabulated the diviſor 6123, you ſee that 6123 cannot be had in 2179; therefore take five places, and on the rods find a number that is equal or next leſs to 21797, which is 18369; that is, 3 times the diviſor; wherefore ſet 3 in the quotient, and ſubſtract 18369 from the figures above, and there will remain 3428; to which add 8, the next figure of the dividend, and ſeek again on the rods for it, or the next leſs, which you will find to be five times; therefore ſet 5 in the quotient, and ſubtract 30615 from 34288, and there will remain 3673; to which add 8, the laſt figure in the dividend, and finding it to be juſt 6 times the diviſor, ſet ſix in the quotient.

```
6123)2179788(356
     18369··
     -------
      34288
      30615
      -----
       36738
       36738
       -----
       00000
```

NEPETA, in botany, a genus of the didynamia gymnoſpermia claſs. The intermediate lacinium of the inferior lip is crenated; the margin of the faux is reflected; and the ſtamina are near each other. There are 14 ſpecies, only one of which, *viz.* the cataria, nap, or cat-mint, is a native of Britain.

NEPHEW, a term relative to uncle and aunt, ſignifying a brother or ſiſter's ſon; who, according to the civil law, is in the third degree of conſanguity; but according to the canon, in the ſecond.

NEPHRITIC, ſomething that relates to the kidneys.

NEPHRITIC WOOD, a wood of a very denſe and compact texture, and of a fine grain, brought us from New Spain, in ſmall blocks, in its natural ſtate, and covered with its bark.

This wood is a very good diuretic, and is ſaid to be of

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of great uſe with the Indians in all diſeaſes of the kidneys and bladder, and in ſuppreſſions of urine, from whatever cauſe. It is alſo recommended in fevers and obſtructions of the viſcera. The way of taking it, among the Indians, is only an infuſion in cold water.

NEPHRITICS, in pharmacy, medicines proper for diſeaſes of the kidneys, eſpecially the ſtone.

Such particularly are the roots of althæa, dog's graſs, aſparagus, ſago, pellitory of the wall, mallows, pimpinella, red chick peaſe, peach kernels, turpentine, the nephritic ſtone, the nephritic wood, *&c.* and diuretics.

NEPHRITIS, in medicine, an inflammation of the kidneys. See MEDICINE.

NEREIDS, in the pagan theology, ſea-nymphs, daughters of Nereus and Doris.

The nereids were eſteemed very handſome, inſomuch that Caſſiope, the wife of Cepheus king of Ethiopia, having triumphed over all the beauties of the age, and daring to vie with the nereids, they were ſo enraged that they ſent a prodigious ſea-monſter into the country; and to appeaſe them, ſhe was commanded by the oracle to expoſe her daughter Andromeda, bound to a rock, to be devoured by the monſter.

In ancient monuments the nereids are repreſented riding upon ſea-horſes, ſometimes with an entire human form, and at other times with the tail of a fiſh.

NEREIS, in zoology, a genus beloging to the order of vermes molluſca. The body is oblong, linear, and fitted for creeping; it is furniſhed with lateral pincilled tentacula. There are eleven ſpecies.

NERICIA, a province of Sweden, bounded by Weſtmania on the north, by Sunderland on the eaſt, and by Gothland on the ſouth and weſt.

NERIUM, in botany, a genus of the pentandria monogynia claſs The ſeeds are furniſhed with plumes; and the tube of the corolla terminates in a lacerated corona. There are four ſpecies, none of them natives of Britain.

NERVES, in anatomy. See ANATOMY, p. 247.

NEST See NIDUS.

NESTORIANS, a Chriſtian ſect, the followers of Neſtorius, biſhop and patriarch of Conſtantinople; who, about the year 529, taught that there were two perſons in Jeſus Chriſt, the divine and the human, which are united, not hypoſtatically or ſubſtantially, but in a myſtical manner; whence he concluded, that Mary was the mother of Chriſt and not the mother of God. For this opinion, Neſtorius was condemned and depoſed by the council of Epheſus; and the decree of this council was confirmed by the emperor Theodoſius, who baniſhed the biſhop to a monaſtery.

NETHERLANDS, anciently called Belgia, but ſince denominated Low Countries or Netherlands from their low ſituation, are ſituated between 2° and 7° of eaſt longitude and between 50° and 53° 30′ of north latitude; and are bounded by the German ſea on the north, Germany on the eaſt, by Lorrain and France on the ſouth, and by another part of France and the Britiſh ſeas on the weſt; extending near three hundred miles in length from north to ſouth, and two hundred miles in breadth from eaſt to weſt. They conſiſt of ſeventeen provinces; ten of which are called the Auſtrian and French Netherlands, and the other ſeven the United Provinces.

NETTINGS, in a ſhip, a ſort of grates made of ſmall ropes ſeized together with rope-yarn or twine, and fixed on the quarters and in the tops; they are ſometimes ſtretched upon the ledges from the waſte trees to the roof trees, from the top of the forecaſtle to the poop; and ſometimes are laid in the waſte of a ſhip, to ſerve inſtead of gratings.

NETTLE, in botany. See URTICA.

Dead NETTLE. See LAMIUM.

NETTLE-TREE. See CELTIS.

NETTUNO, a port town of Italy, in the Campagna di Roma; ſituated on the Mediterranean, thirty miles ſouth-eaſt of Rome.

NEVERS, a city of France, capital of the Nivernois: E. long. 3° 15′, N. lat. 46° 50′.

NEUFCHATEL, the capital of the counties of Neufchatel and Vallengin, in Switzerland, which together form one free and independant ſtate, ſubject to the king of Pruſſia: E. long. 6° 35′, N. lat. 47° 10′.

NEUFCHATEL is alſo a town of Normandy in France, twenty-three miles north-eaſt of Rouen.

NEVIN, or NEWIN, a market town of North-Wales eighteen miles ſouth weſt of Caernarvon.

NEVIS, one of the Caribbee-iſlands, divided from the eaſt end of St. Chriſtophers by a narrow channel.

NEURADA, in botany, a genus of the decandria decagynia claſs. The calix conſiſts of five ſegments, and the corolla of five leaves; the capſule has ten cells, and ten ſharp-pointed ſeeds. There is but one ſpecies, a native of Egypt.

NEURITICS, in pharmacy, medicines good in diſorders of the nerves.

NEUROGRAPHY, ſignifies a deſcription of the nerves.

NEUROPTERA. See NATURAL HISTORY, p. 364, col. 1.

NEUSTAT, a city of Germany, thirty miles ſouth of Vienna.

NEUSTAT is alſo a town of Lower Saxony, ſixteen miles north-weſt of the city of Hanover.

NEUTER, or NEUTER GENDER, in grammar, one of the three genders of nouns, ſo called as being neither maſculine nor feminine. See GRAMMAR.

NEUTRAL SALTS, among chemiſts, a ſort of ſalts neither acid nor alkaline, but partaking of the nature of both. See CHEMISTRY.

NEUTRALITY, the ſtate of a perſon or thing that is neuter, or that takes part with neither ſide.

NEWARK, a borough town of Nottinghamſhire, fifteen miles north-eaſt of Nottingham. It ſends two members to parliament.

NEWBOROUGH, a market town of Angleſey, fifteen miles north-weſt of Beaumaris.

NEWBURG, a city of Bavaria, in Germany, twenty eight miles north-eaſt of Augſburg.

NEWBURG is alſo the name of two other towns of Germany;

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many; one in Swabia, twenty five miles weſt of Stutgart; and the other likewiſe in Swabia, twelve miles north of Baſil.

NEWBURY, a market town of Berkſhire, fifteen miles weſt of Reading.

NEWCASTLE, the county-town of Northumberland, ſituated upon the river Tine: W. long. 1° 10′, N. lat. 55°. It ſends two members to parliament.

NEWCASTLE, a borough-town of Staffordſhire, ten miles north of Stafford. It ſends two members to parliament.

NEWCASTLE, a market town of Caermarthenſhire, in South Wales, fifteen miles north of Caermarthen.

NEWEL, in architecture, is the upright poſt which a pair of winding ſtairs turn about; this is properly a cylinder of ſtone which bears on the ground, and is formed by the end of the ſteps of the winding ſtairs.

NEWFIDLERS SEA, a lake thirty five miles long, on the north-weſt part of Upper Hungary.

NEW FOREST, a part of Hampſhire, oppoſite to the Iſle of Wight, appropriated by act of parliament for the growth of oaks to build the royal navy. See FOREST.

NEWFOUNDLAND, a triangular iſland, three hundred and fifty miles in length from north to ſouth, and two hundred miles in breadth at the baſe from eaſt to weſt; ſituated in North America, between 55° and 61° of weſt longitude, and between 47° and 52° of north latitude; bounded by the narrow ſtraights of Belliſle on the north, by the Atlantic ocean on the eaſt and ſouth, and by the bay of St. Lawrence on the weſt. It is ſubject to England; but the fiſhing banks on this coaſt are frequented by moſt European nations.

NEWHAUSEL, a city of Upper Hungary, ſituated on the river Neytra: E. long. 18° 12′, N. lat. 48° 25′.

NEWMARK, a city of Tranſilvania, ſubject to the houſe of Auſtria: E. long. 23° 25′, N. lat. 47° 35′.

NEWMARK is alſo a town of Germany in the palatinate of Bavaria, thirty miles north-weſt of Ratiſbon.

NEWMARKET, a market town, ſituated both in Cambridgeſhire and Suffolk, twelve miles eaſt of Cambridge.

NEWNHAM, a market town, ten miles ſouth-weſt of Gloceſter.

NEWPORT, a port town of Flanders, nine miles ſouth-weſt of Oſtend.

NEWPORT is alſo a borough town of the Iſle of Wight, which ſends two members to parliament.

NEWPORT is alſo a borough of Cornwal, ten miles weſt of Launceſton, which ſends two members to parliament.

NEWPORT is alſo the name of ſeveral market towns; one fifteen miles eaſt of Shrewſbury, another eighteen miles ſouth-weſt of Monmouth, and a third ſixteen miles north-eaſt of St Davids.

NEWPORT-PAGNEL, a market-town, ſixteen miles north of Ailſbury.

NEWSTAT, the name of ſeveral towns; one eight miles north of Landau another fifteen miles ſouth-weſt of Ratiſbon; a third in Sileſia, fifteen miles ſouth of Breſlaw; a fourth in Hungary, ſixty-five miles eaſt of Tockay; and a fifth in Moravia, ten miles north of Olmutz.

NEWT, or EFT, in zoology. See LACERTA.

NEWTON, a borough town, thirty five miles ſouth of Lancaſter.

It ſends two members to parliament.

NEWTON is alſo a borough town in the Iſle of Wight, twelve miles ſouth of Southampton: it ſends two members to parliament.

NEWTONIAN PHILOSOPHY, the doctrine of the univerſe, and particularly of the heavenly bodies, their laws, affections, &c. as delivered by Sir Iſaac Newton. See ASTRONOMY, MECHANICS, OPTICS, &c.

NEYLAND, a market-town of Suffolk, fourteen miles ſouth-weſt of Ipſwich.

NIAGARA, a prodigious cataract in Canada, in North America, between the lakes Erie and Ontario, where the water falls from high rocks 156 feet perpendicular. The miſt which this fall occaſions may be ſeen at fifteen miles diſtance riſing as high as the clouds, and forming a beautiful rainbow.

NIBANO, a town of Italy, in the dutchy of Parma, thirty five miles weſt of Parma.

NICARAGUA, a province of Mexico; bounded by the province of Honduras on the north, by the North-ſea on the eaſt; by the province of Coſtarica on the ſouth-eaſt, and by the South ſea on the ſouth-weſt; being 400 miles long, and 120 broad. Nicaragua lake runs through the middle of the province.

NICARIA, one of the iſlands of the Archipelago, in Aſiatic Turky: E. long. 26° 5′, N. lat. 37°.

NICASTRO, a town of Naples, in the territory of Calabria; E. long. 16° 40′, N. lat. 39° 15′.

NICE, the capital of the county of the ſame name, ſituated on the mediterranean, at the mouth of the river Var: E. long. 7° 15′, N. lat. 43° 40′.

NICE is alſo a town of Aſiatic Turky, fifty miles ſouth-eaſt of Conſtantinople.

NICHE, in architecture, a hollow ſunk into a wall, for the commodious and agreeable placing a ſtatue.

NICOBAR ISLANDS, a cluſter of iſlands ſituated in the Indian ocean, at the entrance of the gulph of Bengal, between 7° and 10° N. lat.

NICOLAITANS, in church-hiſtory, Chriſtian heretics who aſſumed this name from Nicolas of Antioch; who, being a Gentile by birth, firſt embraced Judaiſm, and then Chriſtianity; when his zeal and devotion recommended him to the church of Jeruſalem, by whom he was choſen one of the firſt deacons. Many of the primitive writers believe that Nicolas was rather the occaſion than the author of the infamous practices of thoſe who aſſumed his name, who were expreſsly condemned by the ſpirit of God himſelf, Rev. ii. 6. And indeed their opinions and actions were highly extravagant and criminal. They allowed a community of wives; made no difference between ordinary meats and thoſe offered to idols. According to Euſebius, they ſubſiſted but a ſhort time; but Tertullian ſays, that they only changed their name, and that their hereſies paſſed into the ſect of the Cainians.

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St. NICOLAS, a town of Lorrain, ten miles ſouth-eaſt of Nancy, at the mouth of the river Dwina.

St. NICOLAS is alſo a port-town of Ruſſia ſituated on the White ſea, ſix miles below Archangel.

St. NICOLAS'S DAY, a feſtival of the Romiſh church, obſerved on the 6th of December.

NICOMEDIA, a city of Aſiatic Turky, thirty miles ſouth-eaſt of Conſtantinople.

NICOPOLIS, a city of European Turky, ſituated on the Danube, 100 miles north-weſt of Adrianople: E. long. 25°, N. lat. 43°.

NICOPPING, a city of Sweden, in the province of Sunderland, fifty miles ſouth of Stockholm.

NICOPPING is alſo the capital of the iſland Hulſter, ſubject to Denmark, and forty-eight miles ſouth-weſt of Copenhagen.

NICOSIA, the capital of the iſland of Cyprus: E. long. 35°, N. lat. 35°.

NICOTERA, a port-town of the kingdom of Naples, thirty miles north eaſt of Reggio.

NICOTIANA, in botany, a genus of the pentandria monogynia claſs. The corolla is funnel ſhaped, with a plaited limbus; the ſtamina are inclined; and the capſule has two valves and two cells. There are 7 ſpecies, all natives of warm climates. The nicotiana tabacum, or tobacco, was firſt brought into Europe about the year 1560, from the iſland Tobago in America. It is cultivated in the following manner.

After ſowing the tobacco ſeeds, the ground is watered every day, and in hot weather covered to prevent its being ſcorched by the ſun; and when the plants are grown to a convenient pitch, they are tranſplanted into a ſoil well prepared for their reception: care is alſo taken to keep this ground clear of weeds, and to pull off the loweſt leaves of the plant, that ten or fifteen of the fineſt leaves may have all the nouriſhment. When theſe leaves are ripe, which is known by their breaking when bent, the ſtalks are cut, and left to dry two or three hours in the ſun; after which they are tied together two and two, and hung on ropes under a ſhade to be dried in the air. And when the leaves are ſufficiently dried, they are pulled from off the ſtalks, and made up in little bundles; which being ſteeped in ſea-water, or, for want thereof, in common water, are twiſted in manner of ropes, and the twiſts formed into rolls, by winding them with a kind of mill around a ſtick: in which condition it is imported into Europe, where it is cut by the tobacconiſts for ſmoaking, formed into ſnuff, and the like. See SNUFF.

Beſides the tobacco of the Weſt-Indies, there are conſiderable quantities cultivated in the Levant, the coaſts of Greece and the Archipelago, the iſland of Malta and Italy.

The marks of good twiſt-tobacco, are a fine ſhining cut, an agreeable ſmell, and that it have been well kept. Tobacco is either taken by way of ſnuff, as a ſternutatory; or as a maſticatory, by chewing it in the mouth; or by ſmoking it in a pipe. It is ſometimes alſo taken in little longiſh pellets put up the noſe, where it is found to produce very good effects, to attract a deal of water or pituita, unload the head, reſolve catarrhs, and make a free reſpiration; for the ſubtile parts of the tobacco in inſpiration, are carried into the trachea and lungs, where they looſen the peccant humours adhering thereto, and promote expectoration. Some have left this tobacco in their noſes all night; but this is found to occaſion vomiting the next morning. Another thing charged on this way of application, is, that it weakens the ſight. When taken in great quantities in the way of ſnuff, it is found to prejudice the ſmelling, greatly diminiſhes the appetite, and in time gives riſe to a phthiſis. That taken in the way of ſmoke, dries and damages the brain. Borrhi, in a letter to Bartholine, mentions a perſon who through exceſs of ſmoking had dried his brain to that degree, that after his death there was nothing found in his ſkull but a little black lump, conſiſting of mere membranes.

Some people uſe the infuſion of tobacco as an emetic; but it is a very dangerous and unjuſtifiable practice, and often produces violent vomiting, ſickneſs, and ſtupidity.

Bates and Fuller give ſome receipts, in which tobacco is an ingredient, with mighty encomiums in aſthmatic caſes. A ſtrong decoction of tobacco, with proper carminatives and cathartics, given clyſter-wiſe, ſometimes proves of good effect in what is uſually called the ſtone-cholic, and alſo in the iliac paſſion. A drop or two of the chymical oil of tobacco, being put on the tongue of a cat, produces violent convulſions, and death itſelf in the ſpace of a minute; yet the ſame oil uſed in lint, and applied to the teeth, has been of ſervice in the tooth-ach: though it muſt be to thoſe that have been uſed to the taking of tobacco; otherwiſe, great ſickneſs, reachings, vomitings, *&c.* happen; and even in no caſe is the internal uſe of it warranted by ordinary practice.

A ſtrong decoction of the ſtalks, with ſharp-pointed dock and alum, is ſaid to be of good ſervice, uſed externally, in cutaneous diſtempers, eſpecially the itch: ſome boil them for that purpoſe in urine. The ſame is ſaid to be infallible in curing the mange in dogs.

Beat into a maſh with vinegar, or brandy, it has been found ſerviceable for removing hard tumours of the hypochondria.

NICOYA, or *St* LUCAR, a port-town of Mexico, ſituated on a bay of the South Sea, in 88° W. long. and 10° 15′ N. lat.

NICTITATING MEMBRANE, a thin membrane, chiefly found in the bird and fiſh kind, which covers the eyes of theſe animals, ſheltering them from the duſt or too much light; yet is ſo thin and pellucid, that they can ſee pretty well through it.

NIDUS, among naturaliſts, ſignifies a neſt, or proper repoſitory for the eggs of birds, inſects, *&c.* wherein the young of theſe animals are hatched and nurſed.

NIECE, a brother or ſiſter's daughter, which in the civil law is reckoned the third degree of conſanguinity.

NIEMEN, or BEREZINA, a river of Poland, which riſes in Lithuania, and falls into a bay of the Baltic ſea, near Memel.

NIEPER, or BORISTHENES, a river which riſes in the middle of Ruſſia; and running ſouth through Poland, enters

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enters the Ruſſian Ukrain, ſeparates Little Tartary from Budziac Tartary, and falls into the Black Sea near Oczakow.

NIESTAT, a town of Lower Saxony, in the duchy of Mecklenburg: E. long. 11° 26′, N. lat. 53° 40′.

NIESTAT is alſo a town of Upper Saxony, in the marquiſate of Brandenburg, 25 miles north-eaſt of Berlin.

NIESTER, a river which riſes in Poland, and running ſouth eaſt divides Podolia in Poland from Moldavia in Turky; and afterwards, dividing Beſſarabia from Budziac Tartary, falls into the Black Sea near Belgorod.

NIGELLA, in botany, a genus of the polyandria pentagynia claſs. The calix is wanting; the corolla conſiſts of five petals; there are five trifid nectaria within the corolla; and there are five connected capſules. The ſpecies are five, none of them natives of Britain.

NIGER, a great river of Africa, which runs from eaſt to weſt through the middle of Negroland, and diſcharges itſelf into the Atlantic ocean by three channels, called Rio Grande, Gambia, and the river Senega. It is 300 miles between the northern and ſouthern channels; and all the country between them is annually overflowed, as Egypt is by the Nile.

NIGHT, that part of the natural day during which the ſun is underneath the horizon; or that ſpace wherein it is duſky.

Night was originally divided by the Hebrews, and other eaſtern nations, into three parts, or watchings. The Romans, and afterwards the Jews from them, divide the night into four parts, or watches, the firſt of which began at ſunſet and laſted till nine at night, according to our way of reckoning; the ſecond laſted till midnight; the third till three in the morning; and the fourth ended at ſunriſe. The ancient Gauls and Germans divided their time, not by days, but by nights; and the people of Iceland, and the Arabs, do the ſame at this day. The like is alſo obſerved of our Saxon anceſtors.

NIGHT-MARE, in medicine. See MEDICINE, p. 157.

NIGHT-WALKERS. See NOCTAMBULI.

NIGHTINGALE, in ornithology. See MOTACILLA.

NIGRITIA. See NEGROLAND.

NILE, a great river in Egypt, having its ſource in Abyſſinia, or the Upper Ethiopia, in 12° north lat. It generally runs from ſouth to north through Abyſſinia into Egypt, and then continues its courſe north in one ſtream till it comes below Cairo to the Delta, where it divides; one branch diſcharging itſelf into the Mediterranean at Damieta, and another a hundred miles to the weſtward of it at Roſetta. There are great rejoicings every year when the Nile riſes to a certain height, their future harveſt depending upon it. The juſt height of the inundation, according to Pliny, is ſixteen cubits; when it ariſes but to twelve or thirteen, a famine is dreaded; and when it exceeds ſixteen, there is alſo danger apprehended. The river begins uſually to riſe in May or June, and is conveyed by reſervoirs, ciſterns, and canals, to the fields and gardens as they want it.

As to the Delta, it is all overflowed.

NIMBUS, in antiquity, a circle obſerved on certain medals, or round the head of ſome emperors, anſwering to the circles of light, drawn around the images of ſaints.

NIMEGUEN, a city of the united Netherlands, ſituated on the river Waal, in the province of Guelderland, 52 miles ſouth eaſt of Amſterdam.

NIMETULAHITES, a kind of Turkiſh monks, ſo called from their founder Nimetulahi, famous for his doctrines and the auſterity of his life.

NIMPO, a city and port-town of China, in the province of Chekiam: E. long. 122°, N. lat. 30°.

NINEVEH, an ancient city of Aſſyria, was ſituated on the eaſtern banks of the river Tygris, oppoſite to the place where Mouſſul now ſtands.

NINOVE, a town of the Auſtrian Netherlands, in the province of Flanders, ſituated on the river Dender, thirteen miles weſt of Bruſſels.

NIO, a ſmall Turkiſh iſland in the Archipelago, ſituated north-weſt of Santorini, remarkable for little but the tomb of Homer, who is ſaid to lie buried here.

NIORT, a town of France, in the province of Orleanois and territory of Poictou, ſituated on the river Seure, twenty eight miles north-eaſt of Rochelle.

NIPHON, the largeſt of the Japan iſlands, ſituated in the Indian ocean about 130 miles eaſt of China; being 600 miles long, and 150 broad, and containing 55 provinces.

NIPPERS, in the menage, are four teeth in the forepart of a horſe's mouth, two in the upper and two in the lower jaw. A horſe puts them forth between the ſecond and third year.

NIPPLES, in anatomy. See ANATOMY, p. 277.

NIPPLE WORT, in botany. See LAPSANA.

NISI PRIUS, in law, a judicial writ which lies in caſes where the jury being impannelled and returned before the juſtices of the bank, one of the parties requeſts to have ſuch a writ, for the eaſe of the country, in order that the trial may come before the juſtices in the ſame county on their coming thither. The purport of a writ of niſi prius is, that the ſheriff is thereby commanded to bring to Weſtminſter the men impanelled, at a certain day, before the juſtices, "niſi prius juſticiarii domini regis ad aſſiſas capiendas venerint."

NISMES, a fine city of France, in the province of Languedoc: E. long. 4° 26′, N. lat. 43° 40′.

NISNA, or NISE-NOVOGOROD, the capital of the province of Niſe, or Little Novogorod, in Ruſſia: E. long. 45°, N. lat. 56°.

NISSA, a city of European Turky, in the province of Servia: E. long. 23°, N. lat. 43°.

NISSA or NIZZA, a town of Italy, in the duchy of Montferrat: E. long. 8° 40′, N. lat. 44° 45′.

NITHSDALE, a county of Scotland, bounded by Clydeſdale on the north, by Annandale on the eaſt, by Solway frith on the ſouth, and by Galloway on the weſt.

NITRACHT, or NYTREA, a town of Hungary, forty miles north-eaſt of Preſburg.

NITRE, or SALT-PETRE. See CHEMISTRY, p. 73. 119.

NIUCHE,

NIUCHE, a kingdom of Chineſian Tartary, north of the province of Laotung.

NIVELLE, a town of the Auſtrian Netherlands, and province of Brabant, fourteen miles ſouth of Bruſſels.

NIXABOUR, or NISABOUR, a city of Perſia, in the province of Choraſſan: E. long. 57° 32′, N. lat. 35° 40′.

NOBILIARY, in literary hiſtory, a book containing the hiſtory of the noble families of a nation, or province: ſuch are Chorier's Nobiliary of Dauphine, and Caumartin's Nobiliary of Provence. The Germans are ſaid to be particularly careful of their nobiliaries, in order to keep up the purity of their families.

NOBILITY, a quality that ennobles, and raiſes a perſon poſſeſſed of it above the rank of a commoner.

The origin of nobility in Europe is by ſome referred to the Goths; who, after they had ſeized a part of Europe, rewarded their captains with titles of honour, to diſtinguiſh them from the common people. In Britain the term nobility is reſtrained to degrees of dignity above knighthood; but every where elſe nobility and gentility are the ſame. The Britiſh nobility conſiſts only of five degrees, *viz.* that of a duke, marquis, earl or count, viſcount, and baron, each of which ſee under their proper articles.

NOBLE, a money of account containing ſix ſhillings and eight-pence.

The noble was anciently a real coin ſtruck in the reign of Edward III. and then called the penny of gold; but it was afterwards called a roſe-noble, from its being ſtamped with a roſe: it was current at 6s. 8d.

NOCERA, a town of Italy, in the territory of the pope and duchy of Spoletto, twenty miles north-eaſt of Spoletto.

Terra NOCERIANA, EARTH OF NOCERA, in the materia medica, a ſpecies of bole, remarkably heavy, of a greyiſh-white colour, of an inſipid taſte, and generally with ſome particles in it which grit between the teeth.

It is much eſteemed, by the Italians, as a remedy for venemous bites, and in fevers; but, except its aſtringent quality, little dependence is to be had on the other virtues aſcribed to it.

NOCTAMBULI, or NIGHTWALKERS, in medicine, a term applied to perſons who have a habit of riſing and walking about in their ſleep.

NOCTILUCA, a ſpecies of phoſphorus, ſo called becauſe it ſhines in the night without any light being thrown upon it; ſuch is the phoſphorus made of urine. See CHEMISTRY, p. 123.

NOCTURNAL, ſomething relating to the night, in contradiſtinction to diurnal.

NOCTURNAL, NOCTURLABIUM, an inſtrument chiefly uſed at ſea, to take the altitude or depreſſion of ſome ſtars about the pole, in order to find the latitude and hour of the night.

Some nocturnals are hemiſpheres, or planiſpheres, on the plane of the equinoctial. Thoſe commonly in uſe among ſeamen are two; the one adapted to the polar ſtar, and the firſt of the guards of the little bear; the other to the pole-ſtar, and the pointers of the great bear.

This inſtrument conſiſts of two circular plates, (Plate CXXXIV. fig. 2.) applied to each other. The greater, which has a handle to hold the inſtrument, is about 2½ inches diameter, and is divided into twelve parts, agreeing to the twelve months; and each month ſub-divided into every fifth day; and ſo as that the middle of the handle correſponds to that day of the year wherein the ſtar here regarded has the ſame right aſcenſion with the ſun. If the inſtrument be fitted for two ſtars, the handle is made moveable. The upper left circle is divided into twenty-four equal parts for the twenty four hours of the day, and each hour ſub-divided into quarters. Theſe twenty four hours are noted by twenty four teeth to be told in the night. Thoſe at the hours 12, are diſtinguiſhed by their length. In the centre of the two circular plates is adjuſted a long index, A, moveable upon the upper plate. And the three pieces, *viz.* the two circles and index, are joined by a rivet which is pierced through the centre with a hole, through which the ſtar is to be obſerved.

To uſe the NOCTURNAL, turn the upper plate till the long tooth, marked 12, be againſt the day of the month on the under plate: then, bringing the inſtrument near the eye, ſuſpend it by the handle with the plane nearly parallel to the equinoctial; and viewing the pole-ſtar through the hole of the centre, turn the index about, till, by the edge coming from the centre, you ſee the bright ſtar or guard of the little bear (if the inſtrument be fitted to that ſtar:) then that tooth of the upper circle, under the edge of the index, is at the hour of the night on the edge of the hour circle: which may be known without a light, by counting the teeth from the longeſt, which is for the hour 12.

NODATED HYPERBOLA, a name given by Sir Iſaac Newton, to a kind of hyperbola, which, by turning round, decuſſates or croſſes itſelf.

NODE, a tumour ariſing on the bones, and uſually proceeding from ſome venereal cauſe; being much the ſame with what is otherwiſe called exoſtoſis.

NODES. See ASTRONOMY, p. 477.

NODUS, or NODE, in dialling, a certain point or pole in the gnomon of a dial, by the ſhadow or light whereof either the hour of the day in dials without furniture, or the parallels of the ſun's declination, and his place in the ecliptic, *&c.* in dials with furniture, are ſhewn. See DIALLING.

NOETIANS, in church hiſtory, Chriſtian heretics in the IIId century, followers of Noetius, a philoſopher of Epheſus, who pretended that he was another Moſes, ſent by God; and that his brother was a new Aaron. His hereſy conſiſted in affirming that there was but one perſon in the Godhead; and that the Word and the Holy Spirit were but external denominations, given to God, in conſequence of different operations; that as Creator, he is called Father; as Incarnate, Son; and as deſcending on the apoſtles, Holy Ghoſt.

NOGAIAN TARTARS, a nation which inhabits that part of Circaſſia, in Aſiatic Turky, that lies between the Palus Meotis and the Caſpian ſea.

NOGENT, a town of France, in the province of Champaign, ſituated on the river Seine, twenty five miles north-weſt of Troyes.

NOLA,

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NOLA, a town of Italy, in the kingdom of Naples, situated 16 miles eaſt of Naples.

NOLI, a town of Italy in the territory of Genoa, ſituated on the bay of Genoa, thirty five miles ſouth weſt of that city.

NOMARCHA, in Egyptian antiquity, the governor or commander of a nome. Egypt was anciently divided into ſeveral regions or quarters, called nomes.

NOMBRE DE DIOS, a town of Mexico, in the province of Darien, a little to the eaſtward of Porto Bello: W. long. 83°, and N. lat. 10°.

NOMBRIL POINT, in heraldry, is the next below the feſs point, or the very centre of the eſcutcheon. See POINT.

Suppoſing the eſcutcheon divided into two equal parts below the feſs, the firſt of theſe diviſions is the nombril, and the lower the baſe.

NOME, or NAME, in algebra, denotes any quantity with a ſign prefixed or added to it, whereby it is connected with ſome other quantity, upon which the whole becomes a binomial, trinomial, or the like. See ALGEBRA.

NOMENCLATOR, in Roman antiquity, was uſually a ſlave, who attended upon perſons that ſtood candidates for offices, and prompted or ſuggeſted to them the names of all the citizens they met, that they might court them, and call them by their names; which, among that people, was the higheſt piece of civility.

NOMENCLATORES, among the botanical authors, are thoſe who have employed their labours about ſettling and adjuſting the right names, ſynonymes, and etymologies of names, in regard to the whole vegetable world.

NOMENCLATURE, a catalogue of ſeveral of the more uſual words in any language, with their ſignifications, compiled in order to facilitate the uſe of ſuch words to thoſe who are to learn the tongue: ſuch are our Latin, Greek, French, *&c.* nomenclatures.

NOMINALS, NOMINALISTS, a ſect of ſchool philoſophers, the diſciples and followers of Occam, or Ocham, an Engliſh cordelier, in the XIVth century. They were great dealers in words, whence they were vulgarly denominated word-ſellers; but had the denomination of nominaliſts, becauſe that, in oppoſition to the realiſts, they maintained that words, and not things, were the object of dialectics.

NOMINATIVE, in grammar, the firſt caſe of nouns which are declinable. See GRAMMAR.

NONAGE, in law, generally ſignifies all the time a perſon continues under the age of one and twenty; but in a ſpecial ſenſe, it is all the time a perſon is under the age of fourteen.

NON-CAPE, in geography, a promontory on the weſt coaſt of Africa, oppoſite to the Canary iſlands.

NON-ENTRY, in Scots law, See LAW, Tit. xii. 5.

NON-NATURALS, in medicine, ſo called becauſe by their abuſe they become the cauſes of diſeaſes.

Phyſicians have divided the non-naturals into ſix claſſes, *viz.* the air, meats and drinks, ſleep and watching, motion and reſt, the paſſions of the mind, the retentions and excretions.

NON-SUIT, ſignifies the dropping of a ſuit or action, or a renouncing thereof by the plaintiff or defendant.

NONCONFORMISTS. See DISSENTERS.

NONE, one of the ſeven canonical hours in the Romiſh church, anſwering to three o'clock in the afternoon.

NONES, in the Roman kalendar, the fifth day of the months January, February, April, June, Auguſt, September, November, and December; and the ſeventh of March, May, July, and October. March, May, July, and October, had ſix days in their nones; becauſe theſe alone, in the ancient conſtitution of the year by Numa, had thirty-one days a-piece, the reſt having only twenty-nine, and February thirty: but when Cæſar reformed the year, and made other months contain thirty one days, he did not allot them ſix days of nones. See KALENDAR.

NORDEN, a port-town of Germany, in the circle of Weſtphalia, and county of Embden, twelve miles north of Embden.

NORFOLK, a county of England, bounded by the German ſea on the north and eaſt; by Suffolk on the ſouth, and by the fens of Lincolnſhire and the iſle of Ely on the weſt.

NORFOLK, a county of Virginia, north of Carolina, and contiguous to that province.

NORMANDY, a province of France, bounded by the eaſt channel on the north, by Picardy and the iſle of France on the weſt, by Orleanois on the ſouth, by Britany and another part of the eaſt channel on the weſt.

NORROY, the title of the third of the three kings at arms.

NORTH, one of the four cardinal points. See NAVIGATION.

NORTH CURRY, a market-town of Somerſetſhire, ſeventeen miles ſouth-weſt of Wells.

NORTH FORELAND, a cape in the iſle of Thanet, on the eaſt coaſt of Kent, four miles eaſt of Margate.

NORTH SEA, a name given to all that part of the Atlantic Ocean which lies north of Terra Firma, in South America.

NORTH-WEST *paſſage*. A north-weſt paſſage by Hudſon's Bay, into the pacific ocean, has been more than once attempted of late years, but hitherto without ſucceſs. Some greatly doubt of the practicableneſs of ſuch an enterprize, and think the obſervations made by the Ruſſians give us ſmall hopes. Some general things may be ſeen in the Phil. Tranſ. N° 482. ſect. 14. It appears from thence, that the Ruſſians have paſſed between the land of Nova Zembla, and the coaſt of Aſia; and, as the Dutch did formerly diſcover the northern coaſts of Nova Zembla, we may now be well aſſured that that country is really an iſland.

NORTHALLERTON, a borough-town of the north riding of Yorkſhire, twenty-two miles north-weſt of York. It ſends two members to parliament.

NORTHAMPTON, the capital of Northamptonſhire, ſituated on the river Nen: W. long. 55′, and N. lat. 52° 15′. It ſends two members to parliament.

NORTHAMPTON, is alſo a county of Virginia, in North America,

America, which forms the ſouth part of the peninſula on the eaſtern ſhore of Virginia.

NORTHAUSEN, a town of Germany in the circle of Upper Saxony, and territory of Thuringia, fifty-five miles ſouth-weſt of Magdeburg.

NORTHLEECH, a market town of Gloceſterſhire, fifteen miles eaſt of Gloceſter.

NORTHUMBERLAND, a county of England, bounded on the north by Scotland, on the eaſt by the German ſea, on the ſouth by Durham, and on the weſt by Cumberland and part of Scotland.

NORTHUMBERLAND is alſo a county of Virginia, lying at the mouth of the river Patowmac.

NORTHWICH, a market town of Cheſhire, ſixteen miles north-eaſt of Cheſter.

NORWAY, a kingdom of Europe, ſituated between 4° and 30° eaſt longitude, and between 58° and 72° north latitude, bounded by the Atlantic ocean on the north and weſt, by Swediſh Lapland and other provinces of Sweden on the eaſt, and by the ſea called the Categate and Schaggeric on the ſouth. It is a cold barren country, ſubject to Denmark.

NORWAY-RAT, in zoology. See MUS.

NORWICH, a large city of great trade in Norfolk, ſituated 20 miles weſt of Yarmouth and the German ocean: E. long. 1° 26′, and N. lat. 52° 40′. It ſends two members to parliament.

NOSE, in anatomy. See ANATOMY, p. 161, 162, 163, 293.

NOTARY, ſignifies a perſon, uſually ſome ſcrivener, who takes notes, or frames ſhort-draughts, of contracts, obligations, charter-parties, or other writings. At preſent we call him a notary-public who publicly atteſts deeds, or writings, in order to make them authentic in another nation: but he is principally employed in buſineſs concerning merchants, as making proteſts of bills of exchange &c. And noting a bill, is where he goes to take notice of a merchant's refuſal to accept or pay the ſame.

NOTATION, in arithmetic. See ARITHMETIC, p. 366.

NOTES, in muſick, characters which mark the ſounds, *i. e.* the elevations and fallings of the voice, and the ſwiftneſs and ſlowneſs of its motions. See MUSICK.

NOTE is likewiſe uſed for a mark made in a book or writing where there occurs ſomething remarkable and worthy of particular notice: as alſo for an obſervation or explication of ſome paſſage in an author added in the margin, at the bottom of the page, or elſewhere, in which ſenſe it ſtands contradiſtinguiſhed to text.

NOTE, is alſo a minute, or ſhort writing, containing ſome article of buſineſs, in which ſenſe we ſay, promiſſary note, note of hand, bank note, &c.

NOTHUS, ſignifies ſpurious or baſtard; whence it is figuratively applied by phyſicians, &c. to ſuch diſeaſes as though in reſpect of a ſimilitude of ſymptoms, &c. they have the ſame denomination as ſome others, yet are of a different origin, ſeat, or the like, from the ſame.

NOTION, in logic, an idea or repreſentation of any thing in the mind. See LOGIC and METAPHYSICS.

NOTITIA, in literary hiſtory, a book that gives an account of a particular country, city, or other place: ſuch is the Notitia Imperii Romani, Notitia Romæ Antiquæ, &c.

NOTO, the capital of a province of the ſame name in Sicily, twenty miles ſouth of Syracuſe, E. long. 15°, N. lat. 37° 15′.

NOTONECTA, the BOAT-FLY a genus of inſects belonging to the order hemiptera. The beak is inflected; the antennæ are ſhorter than the thorax; the four wings are plaited croſs-ways; and the feet are hairy, and fitted for ſwimming. There are three ſpecies, diſtinguiſhed by their colour.

NOTTEBURG, a city of Ruſſia, ſituated on an iſland in the lake Lodoga, twenty five miles eaſt of Peterſburg.

NOTTINGHAM, the capital of Nottinghamſhire, ſituated about a mile north of the river Trent; W. long. 1° 5′, N. lat. 53°. It ſends two members to parliament.

NOVA-SCOTIA. See SCOTLAND.

NOVA-ZEMBLA, or Newland, called by the Dutch the iſland of Weygats, is ſituated in the frozen ocean, between 50° and 80° eaſt longitude, and between 70° north latitude and the north pole: it is ſeparated from the province of Samoida, in Ruſſia, by the ſtraits of Weygats.

NOVARA, the capital of the Novareſe, in the duchy of Milan, forty miles weſt of Milan.

NOVATIANS, a Chriſtian ſect which ſprang up in the third century, ſo called from Novatian a prieſt of Rome, or Novatus an African biſhop who ſeparated from the communion of pope Cornelius, whom Novatian charged with a criminal lenity towards thoſe who had apoſtatized during the perſecution of Decius. He denied the church's power of remitting mortal ſins, upon the offender's repentance; and at laſt went ſo far as to deny that the apoſtles could ever hope for pardon even from God himſelf.

NOVATION, or INNOVATION, in the civil law, denotes the change of one kind of obligation for another; as when a promiſe is accepted inſtead of a written obligation.

NOVATION, in Scots law. See LAW, Tit. xxiii. 7.

NOVEL, in matters of literature, a fictitious hiſtory of a ſeries of entertaining events in common life, wherein the rules of probability are or ought to be ſtrictly preſerved.

NOVELLARA, a town of Italy, in the duchy of Mantua, twenty miles ſouth of the city of Mantua.

NOVEMBER, in chronology, the eleventh month of the Julian year, conſiſting only of thirty days; it got the name of November, as being the ninth month of Romulus's year, which began with March.

NOVEMVIRI, the nine magiſtrates of Athens, more uſually called archons.

NOVIGRAD, a town of Dalmatia, in 17° 30′ E. long. and 44° 30′ N. lat.

NOUN, in grammar, a part of ſpeech, which ſignifies things without any relation to time: as a man, a houſe, ſweet, bitter, &c. See GRAMMAR.

NOVOGOROD, the capital of a province of the ſame name in Muſcovy, ſituated on the river Wolcoff, 130 miles

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miles ſouth eaſt of Peterſburg; E. long. 34°, N. lat. 58°.

It is an archbiſhop's ſee, and has 180 churches and monaſteries.

NOVOGRODECK, a city of Lithuania, in Poland: E. long. 25° 30′, N. lat. 53° 45′.

NOURISHMENT. See NUTRITION.

NOWED, in heraldry, ſignifies knotted, from the Latin *nodatus*; being applied to the tails of ſuch creatures as are very long, and ſometimes repreſented in coat-armour, as if tied up in a knot.

NUBIA, a country of Africa, bounded by the deſart of Barca, on the north; by Egypt and Abyſſinia, on the eaſt; by the Lower Ethiopia, on the ſouth; and by the deſarts of Africa on the weſt.

NUCHA, the nape of the neck.

NUCIFEROUS TREES, ſuch as bear nuts.

NUCIFRAGA, in ornithology. See CORVUS.

NUCLEUS, in general denotes the kernel of a nut, or even any ſeed incloſed within a huſk.

The term nucleus is alſo uſed for the body of a comet, otherwiſe called its head. See ASTRONOMY, p. 444.

NUDITIES, in painting and ſculpture, denotes thoſe parts of an human figure which are not covered with any drapery; or thoſe parts where the carnation appears.

NULLITY, in law ſignifies any thing that is null or void: thus there is a nullity of marriage, where perſons marry within the degrees, or where infants marry without conſent of their parents or guardians.

NUMBER. See ARITHMETIC.

Golden NUMBER. See ASTRONOMY, p. 495.

NUMBER, in grammar, a modification of nouns verbs, *&c.* to accommodate them to the varieties in their objects, conſidered with regard to number. See GRAMMAR.

NUMBERS, in poetry. See VERSIFICATION

Book of NUMBERS, the fourth book of the Pentateuch, taking its denomination from its numbering the families of Iſrael.

A great part of this book is hiſtorical, relating to ſeveral remarkable paſſages in the Iſraelites march through the wilderneſs. It contains a diſtinct relation of their ſeveral movements from one place to another, or the two and forty ſtages through the wilderneſs, and many other things, whereby we are inſtructed and confirmed in ſome of the weightieſt truths that have immediate reference to God and his providence in the world. But the greateſt part of this book is ſpent in enumerating theſe laws and ordinances, whether civil or ceremonial, which were given to God, but not mentioned before in the preceding books.

NOMENIUS, in ornithology, a genus of birds of the order of the ſcolopaces; the beak of which is of a figure approaching to a cylindrical one; it is obtuſe at the point, and is longer than the toes; the feet have each 4 toes connected together. This genus comprehends the curlew, the woodcock, the great plover, and the ſnipe See CURLEW. *&c.*

NUMERAL LETTERS, thoſe letters of the alphabet which are generally uſed for figures; as I, one; V, five; X, ten; L, fifty; C, a hundred; D, five hundred; M, a thouſand; *&c.*

NUMERATION, or NOTATION, in arithmetic. See ARITHMETIC, p. 366.

NUMERATOR *of a fraction*. See ARITHMETIC, p. 387.

NUMERICAL, NUMEROUS, or NUMERAL, ſomething belonging to numbers; as numerical algebra is that which makes uſe of numbers, inſtead of letters of the alphabet. Alſo, numerical difference, is the difference whereby one individual is diſtinguiſhed from another. Hence a thing is ſaid to be numerically the ſame, when it is ſo in the ſtricteſt ſenſe of the word.

NUMIDIA, in ornithology, a genus belonging to the order of gallinæ. On each ſide of the head there is a kind of coloured fleſhy horn; and the beak is furniſhed with cere near the noſtrils. There is but one ſpecies, a native of Africa.

NUMIDIA, the ancient name of Biledulgerid, in Africa.

NUMISMATOGRAPHIA, a term uſed for the deſcription and knowledge of ancient medals and coins, whether of gold, ſilver, or braſs.

NUMMUS, among the Romans, a piece of money otherwiſe called ſeſtertius.

NUN, a woman, in ſeveral Chriſtian countries, who devotes herſelf, in a cloiſter or nunnery, to a religious life.

There were women in the ancient Chriſtian church who made public profeſſion of virginity before the monaſtic life was known in the world, as appears from the writings of Cyprian and Tertullian. Theſe, for diſtinction's ſake, are ſometimes called eccleſiaſtical virgins, and were commonly enrolled in the canon or matricula of the church. They differed from the monaſtic virgin chiefly in this, that they lived privately in their father's houſes, whereas the others lived in communities: but their profeſſion of virginity was not ſo ſtrict as to make it criminal in them to marry afterwards if they thought fit. As to the conſecration of virgins, it had ſome things peculiar in it; it was uſually performed publicly in the church by the biſhop. The virgin made a public profeſſion of her reſolution, and then the biſhop put upon her the accuſtomed habit of ſacred virgins. One part of this habit was a veil, called the ſacrum velamen; another was a kind of mitre or coronet worn upon the head. At preſent, when a woman is to be made a nun, the habit, veil, and ring of the candidate are carried to the altar; and ſhe herſelf, accompanied by her neareſt relations, is conducted to the biſhop, who, after maſs and an anthem, the ſubject of which is, "that ſhe ought to have her lamp lighted, becauſe the bridegroom is coming to meet her," pronounces the benediction: then ſhe riſes up, and the biſhop conſecrates the new habit, ſprinkling it with holy water. When the candidate has put on her religious habit, ſhe preſents herſelf before the biſhop, and ſings on her knees, *Ancilla Chriſti ſum*, &c. then ſhe receives the veil, and afterwards the ring by which ſhe is married to Chriſt; and laſtly the crown of virginity.

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ginity. When ſhe is crowned, an anathema is denounced againſt all who ſhall attempt to make her break her vows.

NUNCIO, or NUNTIO, an ambaſſador from the pope to ſome catholic prince or ſtate; or a perſon who attends on the pope's behalf at a congreſs, or an aſſembly of ſeveral ambaſſadors.

NUNCUPATIVE, in the ſchools, ſomething that is only nominal, or has no exiſtence but in name.

NUNCUPATIVE TESTAMENT, in Scots law. See LAW, Tit. xxviii. 2.

NUNDINAL, NUNDINALIS, a name which the Romans gave to the eight firſt letters of the alphabet, uſed in their kalendar.

This ſeries of letters, A, B, C, D, E, F, G, H, is placed and repeated ſucceſſively from the firſt to the laſt day of the year: one of theſe always expreſſed the market days, or the aſſemblies called nundinæ, *quaſi novendinæ*, becauſe they returned every nine days. The country people, after working eight days ſucceſſively, come to town the ninth, to ſell their ſeveral commodities, and to inform themſelves of what related to religion and government. Thus the nundinal day being under A on the firſt, ninth, ſeventeenth, and twenty fifth days of January, *&c.* the letter day will be the nundinal letter of the year following. Theſe nundinals bear a very great reſemblance to the dominical letters, which return every eight days, as the nundinals did every nine.

NUPTIAL RITES, the ceremonies attending the ſolemnization of marriage, which are different in different ages and countries.

NURENBURG, the capital of a territory of the ſame name, in the circle of Franconia, in Germany: E. long. 11°, N. lat. 49° 30′.

NURSERY, in gardening, is a piece of land ſet apart for raiſing and propagating all ſorts of trees and plants, to ſupply the garden and other plantations. See GARDENING.

NUSANCE, in law, a thing done to the annoyance of another.

Nuſances are either public or private. A public nuſance is an offence againſt the public in general, either by doing what tends to the annoyance of all the king's ſubjects, or by neglecting to do what the common good requires: in which caſe all annoyances and injuries to ſtreets, high-ways, bridges, and large rivers, as alſo diſorderly ale-houſes, bawdy-houſes, gaming-houſes, ſtages for rope-dancers, *&c.* are held to be common nuſances. A private nuſance is when only one perſon or family is annoyed, by the doing of any thing; as where a perſon ſtops up the light of another's houſe, or builds in ſuch a manner that the rain falls from his houſe upon his neighbour's.

NUT, among botaniſts, denotes a pericarpium of an extraordinary hardneſs, incloſing a kernel or ſeed.

NUTATION, in aſtronomy, a kind of tremulous motion of the axis of the earth, whereby, in each annual revolution, it is twice inclined to the ecliptic, and as often returns to its former poſition.

NUTMEG, the kernel of a large fruit, not unlike the peach.

The nutmeg is ſeparated from its inveſtient coat, the mace, before it is ſent over to us; except that the whole fruit is ſometimes imported in preſerve, by way of ſweetmeat, or as a curioſity. See MACE.

The nutmeg, as we receive it, is of a roundiſh or oval figure, of a tolerably compact and firm texture, but eaſily cut with a knife, and falling to pieces on a ſmart blow. Its ſurface is not ſmooth, but furrowed with a number of wrinkles, running in various directions, though principally longitudinally. It is of a greyiſh brown colour on the outſide, and of a beautiful variegated hue within, being marbled with brown and yellow variegations, running in perfect irregularity through its whole ſubſtance. It is very unctuous and fatty to the touch, when powdered; and is of an extremely agreeable ſmell, and of an aromatic taſte.

There are two kinds of nutmeg in the ſhops, the one called by authors the male, and the other the female. The female is the kind in common uſe, and is of the ſhape of an olive: the male is long and cylindric, and has leſs of the fine aromatic flavour than the other; ſo that it is much leſs eſteemed, and people who trade largely in nutmegs will ſeldom buy it. The longer male nutmeg, as we term it, is called by the Dutch the wild nutmeg. It is always diſtinguiſhable from the others, as well by its want of fragrancy, as by its ſhape: it is very ſubject to be worm-eaten, and is ſtrictly forbid, by the Dutch, to be packed up among the other, becauſe it will give occaſion to their being worm-eaten too, by the inſects getting from it into them, and breeding in all parts of the parcel.

The largeſt, heavieſt, and moſt unctuous of the nutmegs are to be choſen, ſuch as are of the ſhape of an olive, and of the moſt fragrant ſmell. The Dutch import them from the Eaſt-Indies.

Nutmeg is greatly uſed in our foods, and is of excellent virtues as a medicine; it is a good ſtomachic, it promotes digeſtion, and ſtrengthens the ſtomach. It alſo ſtops vomiting; is an excellent remedy in flatuſes; and is happily joined with rhubarb, and other medicines, in diarrhœas. It is obſerved to have a ſoporific virtue, and to exert it too ſtrongly, if taken in immoderate quantities. It has a conſiderable degree of aſtringency; and given, after toaſting before the fire till throughly dry and crumbly, it has been ſometimes known alone to cure diarrhœas.

NUTRITION, in the animal œconomy, is the repairing the continual loſs, which the different parts of the body undergo. The motion of the parts of the body, the friction of theſe parts with each other, and eſpecially the action of the air, would deſtroy the body entirely, if the loſs was not repaired by a proper diet, containing nutritive juices; which being digeſted in the ſtomach, and afterwards converted into chyle, mix with the blood, and are diſtributed through the whole body for its nutrition.

In young perſons, the nutritive juices not only ſerve to repair the parts that are damaged, but alſo to increaſe them, which is called growth.

In grown perſons, the cuticle is every where conſtantly deſquamating, and again renewing; and in the ſame manner the parts rubbed off, or otherwiſe ſepa-

rated

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rated from the fleſhy parts of the body, are ſoon ſupplied with new fleſh; a wound heals, and an emaciated perſon grows plump and fat.

Buffon, in order to account for nutrition, ſuppoſes the body of an animal, or vegetable, to be a kind of mould, in which the matter neceſſary to its nutrition is modelled and aſſimilated to the whole. But, continues he, of what nature is this matter, which an animal, or vegetable, aſſimilates to its own ſubſtance? What power is it that communicates to this matter the activity and motion neceſſary to penetrate this mould? and, if ſuch a force exiſt, would it not be by a ſimilar force that the internal mould itſelf might be reproduced?

As to the firſt queſtion, he ſuppoſes that there exiſts in nature an infinite number of living organical parts, and that all organized bodies conſiſt of ſuch organical parts; that their production coſts nature nothing, ſince their exiſtence is conſtant and invariable; ſo that the matter which the animal, or vegetable, aſſimilates to its ſubſtance, is an organical matter, of the ſame nature with that of the animal, or vegetable, which conſequently may augment its volume, without changing its form, or altering the quality of the ſubſtance in the mould.

As to the ſecond queſtion: There exiſt, ſays he, in nature, certain powers, as that of gravity, that have no affinity with the external qualities of the body, but act upon the moſt intimate parts, and penetrate them throughout, and which can never fall under the obſervation of our ſenſes.

And, as to the third queſtion, he anſwers, that the internal mould itſelf is reproduced, not only by a ſimilar power, but it is plain that it is the very ſame power that cauſes the unfolding and reproduction thereof: for it is ſufficient, proceeds he, that in an organized body that unfolds itſelf, there be ſome part ſimilar to the whole, in order that this part may one day become itſelf an organized body, altogether like that of which it is actually a part.

NUX PISTACHIA See PISTACHIA.

NUYS, a town of Germany, twenty miles north of Cologne.

NYBURG, a town of Denmark, ſituated at the eaſt-end of the iſland of Funen, ten miles eaſt of Odenſee: E. long. 10°, N. lat. 55° 30′.

NYCHTHEMERON, the natural day, or day and night, which together always make twenty-four hours.

NYCTALOPIA, in medicine, a two-fold diſorder of the eye, one of which is oppoſite to the other. In the firſt, the ſight is beſt in the night, and in obſcure places; whereas in a clear light their ſight fails, ſo that they can hardly ſee any thing. In the other ſort of nyctylopia, the patient can ſee nothing at all except in a clear and bright light.

NYCTANTHES, *Arabian* JASMINE, in botany, a genus of the diandria monogynia claſs. The calix and likewiſe the corolla conſiſt of eight ſegments. There are five ſpecies, none of them natives of Britain.

NYCTICORAX, in ornithology. See ARDEA.

NYLAND, a province of Finland, ſituated on the gulph of Finland, weſt of the province of Carelia.

NYMPH, in mythology, an appellation given to certain inferior goddeſſes inhabiting the mountains, woods, waters, *&c.* See MYTHOLOGY.

NYMPH, among naturaliſts, that ſtate of winged inſects between their living in the form of a worm, and their appearing in the winged or moſt perfect ſtate.

NYMPHÆ, in anatomy. See ANATOMY, p. 276.

NYMPHÆA, the WATER-LILY, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of many petals, and the calix of four or five leaves; and the berry has many cells. There are four ſpecies, two of which are natives of Britain, *viz.* the lutea, or yellow water-lily; and the alba, or white water-lily.

NYMPHEUM, in antiquity, a public hall, magnificently decorated, for entertainment, *&c.* and where thoſe who wanted convenience at home held their marriage-feaſts, whence the name.

NYONS, a town of Dauphiné, in France: E. long. 5° 6°, N lat. 44° 28′.

NYSLOT, a town of Sweden in the province of Finland, ſixty miles north of Wyburg: E. long. 29°, N. lat. 62°.

O.

OAK — OAR

OAK, in botany. See QUERCUS.

OAK *of Jeruſalem*, in botany. See CHENOPODIUM.

OAKAM, old ropes untwiſted and pulled out into looſe hemp, in order to be uſed in caulking the ſeams, tree-nails, and bends of a ſhip, for ſtopping or preventing leaks.

OAKHAMPTON, a borough of Devonſhire, twenty miles weſt of Exter, which ſends two members to parliament.

OAR, in navigation, a long piece of wood, made round where it is to be held in the hand, and thin and broad at the other end, for the eaſier cutting and reſiſting the water, and conſequently moving the veſſel, by rowing. Oars for ſhips are generally cut out of fir-timber; thoſe for barges are made out of New-England, or Dantzick-rafters,

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rafters; and thoſe for boats either out of Engliſh aſh, or fir-rafters from Norway.

OAT, in botany. See AVENA.

OATH, is a ſolemn affirmation, in which the perſons ſworn invoke the Almighty to witneſs that their teſtimony is true; renouncing all claim to his mercy, and calling for his vengeance, if it be falſe.

OBADIAH, or *the Prophecy of* OBADIAH, a canonical book of the Old Teſtament, which is contained in one ſingle chapter; and is partly an invective againſt the cruelty of the Edomites, who mocked and derided the children of Iſrael, as they paſſed into captivity, and with other enemies, their confederates, invaded and oppreſſed thoſe ſtrangers, and divided the ſpoil amongſt themſelves; and partly a prediction of the deliverance of Iſrael, and of the victory and triumph of the whole church over her enemies.

OBELISK, in architecture, a truncated, quadrangular, and ſlender pyramid, raiſed as an ornament, and frequently charged either with inſcriptions or hieroglyphics.

Obeliſks appear to be of very great antiquity, and to be firſt raiſed to tranſmit to poſterity precepts of philoſophy, which were cut in hieroglyphical characters: afterwards they were uſed to immortalize the great actions of heroes, and the memory of perſons beloved. The firſt obeliſk mentioned in hiſtory was that of Rameſes king of Egypt, in the time of the Trojan war, which was forty cubits high. Phius, another king of Egypt, raiſed one of forty-five cubits; and Ptolemy Philadelphus, another of eighty-eight cubits, in memory of Arſinoe. Auguſtus erected one at Rome in the Campus Martius, which ſerved to mark the hours on an horizontal dial, drawn on the pavement. They were called by the Egyptian prieſts the fingers of the ſun, becauſe they were made in Egypt alſo to ſerve as ſtyles or gnomons to mark the hours on the ground. The Arabs ſtill call them Pharaoh's needles; whence the Italians call them aguglia, and the French aiguilles.

OBERSTEIN, the capital of the county of the ſame name, in the Palatinate of the Rhine, thirty miles eaſt of Triers.

OBERWESEL, or WESEL, a town of Germany, in the electorate of Triers, thirty-ſeven miles north-eaſt of the city of Triers.

OBJECT, in philoſophy, ſomething apprehended, or preſented to the mind, by ſenſation or by imagination. See METAPHYSICS.

OBJECT-GLASS *of a teleſcope*. See OPTICS.

OBJECTION, ſomething urged to overthrow a poſition, or a difficulty raiſed againſt an allegation or propoſition of a perſon we are diſputing withal.

OBJECTIVE is uſed, in the ſchools, in ſpeaking of a thing which exiſts no otherwiſe than as an object known. The exiſtence of ſuch a thing is ſaid to be objective.

OBLATI, in church hiſtory, were ſecular perſons, who devoted themſelves and their eſtates to ſome monaſtery, into which they were admitted as a kind of lay brothers. The form of their admiſſion, was, putting the bell-ropes of the church round their necks, as a mark of ſervitude. They wore a religious habit, but different from that of the monks.

OBLATION, a ſacrifice, or offering made to God.

OBLIGATION, in Scots law. See LAW Tit. xx.

OBLIQUE, in geometry, ſomething aſlant, or that deviates from the perpendicular. Thus an oblique angle is either an acute or obtuſe one, *i. e.* any angle except a right one.

OBLIQUE CASES, in grammar, are all the caſes except the nominative.

OBLIQUE LINE, that which falling on another line, makes oblique angles with it, *viz.* one acute, and the other obtuſe.

OBLIQUE PLANES, in dialling, are thoſe which recline from the zenith, or incline towards the horizon. See DIALLING.

OBLIQUE SAILING, in navigation. See NAVIGATION.

OBLIQUITY *of the ecliptic*. See ASTRONOMY.

OBLIQUUS, in anatomy, a name given to ſeveral muſcles, particularly in the head, eyes, and abdomen. See ANATOMY, Part II.

OBLONG, in general, denotes a figure that is longer than broad: ſuch is a parallelogram, ellipſis, *&c.*

OBOLUS, in antiquity, an ancient Athenian coin.

Among ancient phyſicians, obolus likewiſe denoted a weight, equal to ten grains.

OBREPTITIOUS, an appellation given to letters patent, or other inſtruments, obtained of a ſuperior by ſurpriſe, or by concealing from him the truth.

OBSCURE, ſomething that is dark and reflects little light, or that is not clear and intelligible.

OBSECRATION, in rhetoric, a figure whereby the orator implores the aſſiſtance of God, or man.

OBSEQUIES, the ſame with funeral ſolemnities. See FUNERAL.

OBSERVATION, among navigators, ſignifies the taking the ſun's or the ſtar's meridian altitude, in order thereby to find the latitude.

OBSERVATORY, a place deſtined for obſerving the heavenly bodies; being generally a building erected on ſome eminence, covered with a terrace for making aſtronomical obſervations.

The more celebrated obſervatories are, 1. The Greenwich-obſervatory, built in 1676, by order of Charles II. at the ſolicitations of Sir Jonas Moor and Sir Chriſtopher Wren; and furniſhed with the moſt accurate inſtruments, particularly a noble ſextant of ſeven feet radius, with teleſcopic ſights.

2. The pariſh-obſervatory, built by the late Louis XIV. in the Fauxbourg St. Jaques.

It is a very ſingular, but withal a very magnificent building; the deſign of monſieur Perault: It is eighty feet high; and at top is a terras.

The difference in longitude between this and the Greenwich obſervatory is 2° 20′ weſt.

In it is a cave, or cellar, 170 feet deſcent, for experiments that are to be made far from the ſun, *&c.* particularly ſuch as relate to congelations, refrigerations, indurations, conſervations, *&c.*

3. Tycho Brahe's obſervatory, which was in the little

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little iſland Ween, or Scarlet iſland, between the coaſts of Schonen and Zeland, in the Baltic.

It was erected and furniſhed with inſtruments at his own expence, and called by him Uraniburg.

Here he ſpent twenty years in obſerving the ſtars: the reſult is his catalogue.

4. Pekin obſervatory. Father Le Compte deſcribes a very magnificent obſervatory, erected and furniſhed by the late emperor of China, in his capital, at the interceſſion of ſome Jeſuits, miſſionaries, chiefly father Verbieſt, whom he made his chief obſerver.

The inſtruments are exceedingly large; but the diviſions leſs accurate, and the contrivance in ſome reſpects leſs commodious than thoſe of the Europeans: the chief are, an armillary, zodiacal ſphere, of ſix Paris feet diameter; an equinoctial ſphere, of ſix feet diameter; an azimuthal horizon, ſix feet diameter; a large quadrant, ſix feet radius; a ſextant, eight feet radius; and a celeſtial globe, ſix feet diameter.

OBSTRUCTION, in medicine, ſuch an obturation of the veſſels, as prevents the circulation of the fluids, whether of the ſound and vital, or of the morbid and peccant kind, through them.

OBTURATOR, in anatomy. See ANATOMY, p. 205.

OBTUSE, ſignifies blunt, dull, *&c.* in oppoſition to acute, ſharp, *&c.* thus we ſay obtuſe angle, obtuſe-angled triange, *&c.*

OBULARIA, in botany, a genus of the didynamia angioſpermia claſs. The calix has two ſegments; the corolla is campanulated, and divided into four ſegments; the capſule has one cell, two valves, and many ſeeds. There is but one ſpecies, a native of Virginia.

OBY, a great river of Ruſſia, which riſes in Kalmuck Tartary, and forms the boundary between Europe and Aſia, till it falls into the frozen ocean, after it has run a courſe of above two thouſand miles.

OCCIDENT, in geography, the weſtward quarter of the horizon, or that part of the horizon where the ecliptic, or the ſun therein, deſcends into the lower hemiſphere, in contradiſtinction to orient. Hence we uſe the word occidental, for any thing belonging to the weſt; as, occidental bezoard, occidental pearl, *&c.*

OCCIPITAL, in anatomy, a term applied to the parts of the occiput, or back part of the ſkull. See ANATOMY.

OCCIPITIS os, the OCCIPITAL BONE, in anatomy. See ANATOMY, p. 156.

OCCULT, ſomething ſecret, hidden, or inviſible. The occult ſciences, are magic, necromancy, cabbala, *&c.*

OCCULT, in geometry, is uſed for a line that is ſcarce perceiveable, drawn with the point of the compaſſes, or a leaden pencil. Theſe lines are uſed in ſeveral operations, as the raiſing of plans, deſigns of building, pieces of perſpective, *&c.* They are to be effaced when the work is finiſhed.

OCCULTATION, in aſtronomy, the time a ſtar or planet is hid from our ſight, by the interpoſition of the body of the moon, or of ſome other planet. See ASTRONOMY.

OCCUPANT, in law, the perſon that firſt ſeizes, or gets poſſeſſion of a thing.

OCCUPATION, in a legal ſenſe, is taken for uſe or tenure; as in deeds it is frequently ſaid, that ſuch lands are or lately were in the tenure or occupation of ſuch a perſon. It is likewiſe uſed for a trade or myſtery.

OCCUPIERS of WALLING, a term in the ſalt-works for the perſons who are the ſworn officers that allot in particular places what quantity of ſalt is to be made, that the markets may not be overſtocked, and ſee that all is carried fairly and equally between the lord and the tenant.

OCEAN, in geography, that vaſt collection of ſalt and navigable waters, in which the two continents, the firſt including Europe, Aſia, and Africa, and the laſt America, are incloſed like iſlands.

OCHLOCRACY, that form of government wherein the populace has the chief adminiſtration of affairs.

OCHNA, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of five petals, and the calix of five leaves; and the berry contains one ſeed. There are two ſpecies, both natives of the Indies.

OCHRE, in natural hiſtory, a genus of earths, ſlightly coherent, and compoſed of fine, ſmooth, ſoft, argillaceous particles, rough to the touch, and readily diffuſible in water.

Ochres are of various colours, as red, yellow, blue, brown, green, *&c.*

OCYMUM, in botany, a genus of the didynamia gymnoſpermia claſs. The ſuperior lip of the calix is round, and the inferior is divided into four ſegments. There are eight ſpecies, none of them natives of Britain.

OCKER, a river of Germany, which, riſing in the ſouthern part of the duchy of Brunſwick, runs north; and paſſing by Wolfembuttle and Brunſwick, falls into the river Aller.

OCKINGHAM, a market-town of Berkſhire, ſeven miles eaſt of Reading.

OCTAETERIDES, in chronology, denotes a cycle of eight years, at the end of which three entire lunar months were added.

This cycle was in uſe at Athens, till Meton diſcovered the golden number.

OCTAGON, or OCTOGON, in geometry, is a figure of eight ſides and angles; and this, when all the ſides and angles are equal, is called a regular octagon, or one which may be inſcribed in a circle.

OCTAGON, in fortification, denotes a place that has eight baſtions. See FORTIFICATION.

OCTAHEDRON, or OCTAEDRON, in geometry, one of the five regular bodies, conſiſting of eight equal and equilateral triangles.

OCTANDRIA, in botany, one of the claſſes of plants eſtabliſhed by Linnæus, the eighth in order. See BOTANY.

OCTANT, or OCTILE, in aſtronomy, that aſpect of two planets, wherein they are diſtant an eighth part of a circle, or 45° from each other.

OCTAPLA, in matters of ſacred literature, denotes a polyglot bible, conſiſting of eight columns, and as many different verſions of the ſacred text; *viz.* the original.

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ginal Hebrew both in Hebrew and Greek characters, Greek verſions, &c.

OCTATEUCH, an appellation given to the eight firſt books of the Old Teſtament.

OCTAVE, in muſick, an harmonical interval, conſiſting of ſeven degrees, or leſſer intervals. See MUSICK.

OCTOBER, in chronology, the tenth month of the Julian year, conſiſting of thirty-one days: it obtained the name of October from its being the eighth month in the kalendar of Romulus.

OCTOSTYLE, in the ancient architecture, is the face of an edifice adorned with eight columns.

OCULUS, the eye, in anatomy. See ANATOMY, p. 289.

OCULUS BELI, in natural hiſtory, one of the ſemi-pellucid gems, of a greyiſh white colour, variegated with yellow, and with a black central nucleus: it is of a roundiſh form, and its variegations very beautifully repreſent the pupil and iris of the eye; whence the name.

OCULUS MUNDI, one of the ſemi-pellucid gems, of a whitiſh-grey colour, without any variegations.

OCZAKOW, a port town of European Turky, the capital of Budziac Tartary: E. long. 35°, N. lat. 46°.

ODA, in the Turkiſh ſeraglio, ſignifies a claſs, order, or chamber. The grand ſeignior's pages are divided into five claſſes or chambers. The firſt, which is the loweſt in dignity, is called the great oda, from the great number of perſons that compoſe it: theſe are the juniors, who are taught to read, write, and ſpeak the languages. The ſecond, is called the little oda; where from the age of fourteen or fifteen years, till about twenty, they are trained up to arms, and the ſtudy of all the polite learning the Turks are acquainted with. The third chamber, called kilar oda, conſiſts of two hundred pages, which, beſides their other exerciſes, are under the command of the kilardgi-bachi, and ſerve in the pantry and fruitery. The fourth conſiſts only of twenty four, who are under the command of the khazineda bachi, and have charge of the treaſure in the grand ſeignior's apartment, which they never enter with cloaths that have pockets. The fifth is called kas-oda, or privy-chamber, and is compoſed of only forty pages, who attend in the prince's chamber. Every night eight of theſe pages keep guard in the grand ſeignior's bed chamber, while he ſleeps: they take care that the light, which is conſtantly kept in the room, does not glare in his eyes, leſt it ſhould awake him; and if they find him diſturbed with troubleſome dreams, they cauſe him to be awaked by one of their agas.

ODA BACHI, or ODDOBASSI, among the Turks, an officer equivalent to a ſerjeant or corporal among us.

ODE, in poetry, a ſong, or a compoſition proper to be ſung.

Among the ancients, odes ſignified no more than ſongs; but with us they are very different things. The ancient odes were generally compoſed in honour of their gods, as many of thoſe of Pindar and Horace.

Theſe had originally but one ſtanza, or ſtrophe; but afterwards they were divided into three parts, the ſtrophe, the antiſtrophe, and the epode. The prieſts going round the altar ſinging the praiſes of the gods, called the firſt entrance, when they turned to the left, the ſtrophe; the ſecond, turning to the right, they called antiſtrophe, or returning; and, laſtly, ſtanding before the altar, they ſung the remainder, which they called the epode.

Heroes and triumphs were alſo ſubjects for the ode; and in courſe of time love and entertainments were likewiſe thought very ſuitable to it. Here Anacreon and Sappho excelled, and Horace has loſt us ſome of both ſorts wrote with peculiar ſweetneſs and elegance. Among the moderns, Dryden's ode on St Cecilia's day, and Pope's on the ſame ſubject, are juſtly allowed to exceed every thing of the kind, either in this, or in any of the modern languages.

ODENSEE, the capital of Funen, one of the largeſt of the Daniſh iſlands in the Baltic, ſituated ſeventy-two miles weſt of Copenhagen.

ODER, a river which riſes in the Carpathian mountains, on the confines of Hungary; runs through Sileſia and Brandenburgh; and then ſeparating the eaſtern from the weſtern Pomerania, divides itſelf into ſeveral channels, and falls into the Baltic ſea.

ODER is alſo a town of Sileſia, ſituated on the river of the ſame name: E. long 17° 17′, N. lat. 49° 45′.

ODERBERG, a town in the duchy of Sileſia, in Bohemia, ſituated on the river Oder; E. long. 17° 45′, N lat. 50° 6′.

ODERNHEIM, a town of Germany, in the palatinate of the Rhine fifteen miles ſouth of Mentz.

ODEUM, in Grecian antiquity, a muſick-theatre, built by Pericles, the inſide of which was filled with ſeats and ranges of pillars; and on the outſide the roof deſcended ſhelving downwards from a point in the centre, with many bendings, in imitation of the king of Perſia's pavilion. Here the muſical prizes were contended for; and here alſo, according to Ariſtophanes, was a tribunal.

ODIHAM, a market-town of Hampſhire, twenty miles north-eaſt of Wincheſter.

ODONTALGIA, the TOOTH ACH, in medicine. See MEDICINE.

ODONTOIDE, in anatomy, an appellation given to a proceſs of the ſecond vertebra of the neck, from its reſemblance to a tooth

ODOROUS, or ODORIFEROUS, appellations given to whatever ſmells ſtrongly, whether they be fetid or agreeable; but chiefly to things whoſe ſmell is briſk, and agreeable.

ODYSSEY, a celebrated epic poem of Homer, wherein are related the adventures of Ulyſſes in his return from the ſiege of Troy.

OECONOMICS, the art of managing the affairs of a family, or community; and hence the perſon who takes care of the revenues and other affairs of churches, monaſteries, and the like, is termed oeconomus.

OECONOMY, denotes the prudent conduct, or diſcreet and frugal management, whether of a man's own eſtate, or that of another.

Animal OECONOMY, comprehends the various operations of

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of nature, in the generation, nutrition, and preſervation of animals. See GENERATION, NUTRITION, &c.

The doctrine of the animal oeconomy is nearly connected with phyſiology, which explains the ſeveral parts of the human body, their ſtructure, uſe, &c. See ANATOMY.

OECUMENICAL, ſignifies the ſame with general, or univerſal; as oecumenical council, biſhop, &c.

OEDEMA, in medicine and ſurgery. See MEDICINE and SURGERY.

OEDENBURG, or EDENBURG, a town of Hungary, thirty miles ſouth of Vienna.

OELAND, a Swediſh iſland in the Baltic ſea, between the continent of Gothland, and the iſle of Gothland: E. long. 16°, N. lat. between 56° and 57° 30'.

OELFELD, a town in the duchy of Magdeburg and circle of Lower Saxony in Germany, twenty miles eaſt of Brunſwick.

OENANTHE, in botany, a genus of the pentandria digynia claſs. The floſcules are ſeſſile, diſſimilar, and barren in the diſk; and the fruit is crowned with a calix. There are five ſpecies, three of them natives of Britain, *viz.* the fiſtuloſa, or water-dropwort; the pimpinelloides, or pimpernel-dropwort; and the crocata, or yellow dropwort.

OENANTHE, in ornithology, a ſpecies of motacilla. See MOTACILLA.

OENAS. See COLUMBA.

OENOPTÆ, in Grecian antiquity, a kind of cenſors at Athens, who regulated entertainments, and took care that none drank too much or too little.

OENOTHERA, in botany, a genus of the octandria monogynia claſs. The calix conſiſts of four ſegments, and the corolla of four petals; the capſule is cylindrical, and the ſeeds are naked. There are ſeven ſpecies, none of them natives of Britain.

OESEL, an iſland at the entrance of the bay of Livonia, in the Baltic ſea; ſituated in 22° of E. long. and 58° of N. lat.

OESOPHAGUS, in anatomy. See ANATOMY, p. 282.

OESTRUS, in zoology, a genus of inſects belonging to the order of diptera. It has no mouth, but the point appears in place of it, without any proboſcis or ſnout. There are five ſpecies, diſtinguiſhed by their colour.

OETING, the capital of the county of the ſame name, in the circle of Swabia, in Germany: E. long. 10° 25', and N. lat. 49'.

OFFENBURG, a free imperial city of the circle of Swabia, in Germany, ſituated on the river Kintzig: E. long. 7° 40', and N. lat. 48° 30'.

OFFENCE in law, an act committed againſt the law, or omitted where the law requires it.

OFFICE, a particular charge or truſt, or a dignity attended with a public function. The word is primarily uſed in ſpeaking of the offices of judicature and policy; as the office of a ſecretary of ſtate, the office of a ſheriff, of a juſtice of peace, &c.

OFFICE alſo ſignifies a place or apartment appointed for officers to attend in, in order to diſcharge their reſpective duties and employments: as the ſecretary's office, office of ordnance, exciſe office, ſignet-office, paper-office, pipe-office, ſix-clerks office, &c.

OFFICE, in architecture, denotes all the apartments appointed for the neceſſary occaſions of a palace or great houſe, as kitchens, pantries, confectionaries, &c.

OFFICE, in the canon-law, is uſed for a benefice that has no juriſdiction annexed to it.

OFFICER, a perſon poſſeſſed of a poſt or office. See the preceding article.

Commiſſion-OFFICERS, are thoſe appointed by the king's commiſſion: ſuch are all from the general to the cornet incluſive, who are thus denominated in contradiſtinction to warrant-officers, who are appointed by the colonel's or captain's warrant, as quarter-maſters, ſerjeants, corporals, and even chaplains and ſurgeons.

Field OFFICERS are ſuch as command a whole regiment, as the colonel, lieutenant-colonel, and major.

Flag OFFICERS. See FLAG-OFFICERS, and ADMIRAL.

General-OFFICERS are thoſe whoſe command is not limited to a ſingle company, troop, or regiment; but extends to a body of forces, compoſed of ſeveral regiments; ſuch are the general, lieutenant-general, major-generals, and brigadiers.

OFFICERS *of the houſehold*. See HOUSEHOLD.

Staff OFFICERS are ſuch as, in the king's preſence, bear a white ſtaff, or wand; and at other times, on their going abroad, have it carried before them by a footman bare-headed: ſuch are the lord ſteward, lord chamberlain, lord treaſurer, &c.

The white ſtaff is taken for a commiſſion, and at the king's death each of theſe officers breaks his ſtaff over the hearſe made for the king's body, and by this means lays down his commiſſion, and diſcharges all his inferior officers.

Subaltern-OFFICERS are all who adminiſter juſtice in the name of ſubjects; as thoſe who act under the earl marſhal, admiral, &c. In the army, the ſubaltern officers are the lieutenants, cornets, enſigns, ſerjeants, and corporals.

OFFICIAL, in the canon-law, an eccleſiaſtical judge, appointed by a biſhop, chapter, abbot, &c. with charge of the ſpiritual juriſdiction of the dioceſe.

OFFICIAL, is alſo a deputy appointed by an archdeacon, as his aſſiſtant, who ſits as judge in the archdeacon's court.

OFFICINAL, in pharmacy, an appellation given to ſuch medicines, whether ſimple or compound, as are required to be conſtantly kept in the apothecaries ſhops.

OFFIDA, a town of Italy ſubject to the pope, twenty-ſix miles ſouth of Loretto.

OFFING, or OFFIN, in the ſea-language, that part of the ſea a good diſtance from ſhore, where there is deep water, and no need of a pilot to conduct the ſhip: thus, if a ſhip from ſhore be ſeen ſailing out to ſea-ward, they ſay, ſhe ſtands for the offing: and if a ſhip having the ſhore near her, have another a good way without her, or towards the ſea, they ſay, that ſhip is in the offing.

OFF-SETS, in gardening, are the young ſhoots, that

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ſpring from the roots of plants; which being carefully ſeparated, and planted in a proper ſoil, ſerve to propagate the ſpecies.

OFF-SETS, in ſurveying, are perpendiculars let fall, and meaſuring from the ſtationary lines to the hedge, fence, or extremity of an encloſure.

OGEE, or O. G. in architecture, a moulding conſiſting of two members, the one concave, and the other convex; or of a round and a hollow, like an S. See ARCHITECTURE.

OGIVE, in architecture, an arch, or branch of a gothic vault; which, inſtead of being circular, paſſes diagonally from one angle to another, and forms a croſs with the other arches.

OGLIO, a river which riſes in the alps, in the county of Trent, and, after running ſouthward through the lake Iſco and duchy of Mantua, falls into the Po a little weſt of Borgoforte.

OHIO, a large river of North America, which, taking its riſe in the mountains of Penſylvania, runs ſouth-weſt; and, after receiving many conſiderable branches, falls into the Meſſaſſippi.

OIL. See CHEMISTRY, p. 92, *&c.*

OINTMENT, in pharmacy. See UNGUENT.

OSIANS, a town of France, in the province of Dauphiné, eighteen miles ſouth-eaſt of Grenoble.

OKEHAM, the capital of Rutlandſhire, fourteen miles eaſt of Leiceſter: W. long. 45′, and N. lat. 52° 40′.

OLAX, in botany, a genus of the triandria monogynia claſs. The corolla is entire; the calix is funnel-ſhaped, and divided into three ſegments; and the nectarium conſiſts of four leaves. There is but one ſpecies, a native of Ceylon.

OLDENBURG, the capital of the county of the ſame name in Weſtphalia: E. long. 7° 32′, and N. lat. 53° 35′.

OLDENDORP, a town of Germany in the circle of Weſtphalia, thirty miles ſouth-weſt of Hanover.

OLDENLANDIA, a genus of the tetrandria monogynia claſs. The corolla conſiſts of four leaves, and the calix of four ſegments; and the capſule has two cells, and many ſeeds. There are four ſpecies, none of them natives of Britain.

OLDENZEL, a city of the United Netherlands, in the province of Overyſſel: E. long. 6° 50′, and N. lat. 52° 30′.

OLD-WIFE-FISH. See BALISTES.

OLEA, in botany, a genus of the diandria monogynia claſs. The corolla has four ſegments, with oval laciniæ; and the drupa contains one ſeed. There are two ſpecies.

This tree grows in the ſouthern parts of France, in Spain, Italy, and other warm countries: with us it is uſually preſerved in the green-houſes of the curious; though it will bear our ordinary winters in the open air, and produce very good fruit. Olives have an acrid, bitter, extremely diſagreeable taſte: pickled (as we receive them from abroad) they prove leſs diſagreeable. The Lucca olives, which are ſmaller than the others, have the weakeſt taſte; the Spaniſh, or larger, the ſtrongeſt; the Provence, which are of a middling ſize, are generally the moſt eſteemed.

The oil obtained from this fruit has no particular taſte or ſmell, and does not greatly differ in quality from oil of almods. Authors make mention of two ſorts of this oil, one expreſſed from the olives when fully ripe, which is our common oil olive; the other, before it has grown ripe: this is called *oleum immaturum*, and *omphacinum*. Nothing is met with in the ſhops under this name; and Lemery affirms, that there is no ſuch oil, unripe olives yielding only a viſcid juice to the preſs. From the ripe fruit, two or three ſorts are obtained, differing in degree of purity; the pureſt runs by light preſſure; the remaining magma, heated and preſſed more ſtrongly, yields an inferior ſort, with ſome dregs at the bottom, called *amurca*. All theſe oils contain a conſiderable portion of aqueous moiſture, and a mucilaginous ſubſtance; which ſubject them to run into a putrid ſtate; to prevent this, the preparers add ſome ſea ſalt, which imbibing the aqueous and mucilaginous parts, ſinks with them to the bottom; by this means the oil becomes more homogene, and conſequently leſs ſuſceptible of alteration. In its paſſage to us, ſome of the ſalt, thrown up from the bottom by the ſhaking of the veſſel, is ſometimes mixed with and detained in the oil, which, in our colder climate, becomes too thick to ſuffer it freely to ſubſide; and hence the oil is ſometimes met with of a manifeſtly ſaline taſte. Oil-olive is uſed in the ſimple balſam of ſulphur, Locatellie's balſam, and ſeveral ointments. It is oftner employed in this laſt intention than the other expreſſed oils, but more rarely for internal medicinal purpoſes.

OLEAGINOUS, ſomething that partakes of the nature of oil, or out of which oil may be expreſſed.

OLECRANUM, or OLECRANON, in anatomy. See ANATOMY, p. 178.

OLERON, an iſland of France, near the coaſt of Poictou, fourteen miles ſouth-weſt of Rochelle, being about fifteen miles long, and ſix broad.

Sea-laws of OLERON, certain laws relating to maritime affairs, made in the time of Rich. I. when he was at the iſland Oleron.

Theſe laws, being accounted the moſt excellent ſea-laws in the world, are recorded in the black book of the admiralty.

OLESCO, a town of upper Volhinia, in Poland: eaſt longitude 24°, and north latitude 50°.

OLFACTORY NERVES. See ANATOMY, p. 248.

OLIBANUM, FRANK-INCENSE, in pharmacy, a dry reſinous ſubſtance, brought to us in detached pieces, or drops as it were, like thoſe of maſtic; but larger, and of a leſs pure and pellucid texture.

It is of a pale yelloviſh white colour, but with ſome mixture of a browniſh caſt in it. It is moderately heavy; its ſmell is ſtrong, but not diſagreeable; and its taſte bitter, acrid, and reſinous.

Olibanum is to be choſen whitiſh, pure, dry, and as much approaching to pellucidity as may be.

Olibanum is greatly commended by many againſt diſorders of the head and breaſt, and againſt diarrhœas and

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and dyſenteries, and profluvia of the menſes, and the fluor albus. Its doſe is from ten grains to a drachm. It is eſteemed by many a ſpecific in pleuriſies, eſpecially when epidemic.

Externally it is uſed in fumigations for diſorders of the head, and againſt catarrhs; and is an ingredient in ſome plaſters. It is a noble balſam in conſumptions, given in ſubſtance, or diſſolved with the yolk of an egg into the form of an emulſion. There is an oil made of it per deliquium, in the ſame manner as that of myrrh: this is done by putting the powder of it in the white of a boiled egg, in a cellar, till it runs into a liquor; this is eſteemed a great coſmetic, and deſtroyer of pimples in the face.

OLIGAEDRA, in natural hiſtory, the name of a genus of cryſtals, and expreſſes that which is compoſed of only a few planes.

The bodies of this claſs are cryſtals of the imperfect kind, being compoſed of columns affixed irregularly to ſome ſolid body at one end, and the other terminated by a pyramid; but the column and pyramid being both pentangular, the whole conſiſts only of ten planes, and not, as the common kind, of twelve.

OLIGARCHY, a form of government, wherein the adminiſtration of affairs is lodged in the hands of a few perſons.

OLINDA, a city and port-town of Braſil: weſt long. 35°, and ſouth lat. 8°.

OLIO, in cookery, denotes a favoury diſh compoſed of a great variety of ingredients, chiefly uſed by the Spaniards.

OLIVA, a port-town of Poland, in the province of regal Pruſſia, only ſix miles weſt of Dantzick.

OLIVARIA CORPORA, in anatomy. See ANATOMY, p. 287.

OLIVE, in botany. See OLEA.

OLIVE-COLOUR, a yellow mingled with black. See OPTICS.

OLIVENZA, a town of Alentejo, in Portugal, ten miles ſouth of Elvas.

OLMUTS, a city of Moravia, ſeventy-five miles north of Vienna.

OLYMPIA, a port-town of the Morea, at preſent called Longinico: eaſt long. 21° 35′, and north lat. 37° 40′.

OLYMPIAD, the ſpace or period of four years, whereby the Greeks reckoned time. See ASTRONOMY, p. 493.

OLYMPIC GAMES were ſolemn games, famous among the ancient Greeks, ſo called from Olympian Jupiter, to whom they were dedicated; and by ſome ſaid to be firſt inſtituted by Jupiter, after his victory over the ſons of Titan; others aſcribe their inſtitution to Hercules, not the ſon of Alcmena, but one of much greater antiquity; others, to Pelops; and others, to Hercules the ſon of Alcmena. Theſe games were ſo conſiderable, that the Greeks made them their epocha, diſtinguiſhing their years by the return of the olympics.

The care and management of theſe games belonged, for the moſt part, to the Eleans, who, on that account, enjoyed their poſſeſſions without moleſtation, or fear of war or violence. They appointed a certain number of judges, who were to take care that thoſe who offered themſelves as competitors performed their preparatory exerciſes; and theſe judges, during the ſolemnity, ſat naked, having before them a crown of victory, formed of wild-olive, which was preſented to whomſoever they adjudged it. Thoſe who were conquerors, were called Olympionices, and were loaded with honours by their countrymen. At theſe games women were not allowed to be preſent; and if any woman was found to have paſſed the river Alpheus, during the ſolemnity, ſhe was to be thrown headlong from a rock.

OLYMPUS, the name of two mountains, the one in Bythinia in the Leſſer Aſia, and the other in the iſland of Cyprus.

OMAN, a province or kingdom in the ſouth-eaſt parts of Arabia Felix.

OMBRE, a celebrated game at cards, borrowed from the Spaniards, and played by two, by three, or by five perſons, but generally by three.

OMBRE DE SOLEIL, SHADOW OF THE SUN, in heraldry, is when the ſun is borne in armory, ſo as that the eyes, noſe, and mouth, which at other times are repreſented, do not appear; and the colouring is thin, ſo that the field can appear through it.

OMBRIA, the ancient name of a province of Italy, in the territory of the pope, now called Spoletto and Perugia.

OMBRO, or LOMBRO, a town of Italy, in the duchy of Tuſcany, and territory of the Siennois, ſituated near the Tuſcan ſea, a little ſouth of the lake of Caſtiglion, forty-five miles ſouth-weſt of Sienna.

OMELET, or AMLET, a kind of pancake or fricaſſee of eggs, with other engredients, very uſual in Spain and France.

OMEN, a certain accident and caſual occurrence that was thought to preſage either good or evil. There were three ſorts of omens among the ancients. One was of things internal, or thoſe which affected the perſons themſelves; the ſecond, of things external, that only appeared to men, but did not make any impreſſion on them; the third were ominous words. Of the firſt ſort were thoſe ſudden conſternations, called panic fears, that ſeized upon men without any viſible cauſe, and were therefore imputed to the dæmons, eſpecially the god Pan: of theſe panics there is frequent mention in hiſtory. The ſecond ſort of omens were of ſuch things as appeared to men, but were not contained in their own bodies. Of theſe there were ſeveral ſorts: the beginning of things were thought to contain ſomething ominous: it was thought a direful omen, when any thing unuſual befel the temples, altars, or ſtatues of the gods. Under the head of external omens are to be placed thoſe which offered themſelves in the way; ſuch were the meeting of an eunuch, a black, a bitch with whelps, a ſnake lying in the road, *&c.* Words were ominous; and as they were good or bad, were believed to preſage accordingly.

OMENTUM, in anatomy. See ANATOMY. p. 266.

OMERS,

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OMERS, or St. Omers, a city of Artois, in the French Netherlands, twenty miles ſouth of Dunkirk, and eighteen ſouth-eaſt of Calais.

OMLANDS, a diviſion of the province of Groningen, in the United Provinces.

OMMEN, a town of the United Netherlands, in the province of Overyſſel, ſituated on the leſſer Vecht, ſeventeen miles north-eaſt of Deventer.

OMOPHAGIA, an ancient Greek feſtival, in honour of Bacchus, ſurnamed Omophagos, *i. e.* eater of raw fleſh. This feſtival was obſerved in the ſame manner with the other feſtivals of Bacchus, in which they counterfeited madneſs; what was peculiar to it, was that the worſhipers uſed to eat the entrails of goats, raw and bloody, in imitation of the god, who was ſuppoſed to do the ſame thing.

OMOPLATE, in anatomy. See Anatomy, p 176.

OMPHALO-MESENTERIC, in anatomy. All fœtuſes are wraped up in at leaſt two coats or membranes; moſt of them have a third, called allantoides, or urinary.

Some, as the dog, cat, hare, *&c.* have a fourth, which has two blood-veſſels, *viz.* a vein and an artery, called omphalo-meſenterics, becauſe paſſing along the ſtring to the navel, and terminating in the meſentery.

ONANDAGOES, one of the tribes of the Iroquois, or Five Nations, ſituated on the lake Ontario, or Frontenac, in North America: they are allies of Great Britain.

ONANIA, or Onanism, terms which ſome late empirics have framed, to denote the crime of ſelf-pollution, mentioned in ſcripture to have been practiſed by Onan, and puniſhed in him with death.

ONEGA-LAKE, a lake upwards of an hundred miles long, and forty broad, ſituated in the empire of Ruſſia between 61° and 63° of north lat. and 35° eaſt longitude.

ONEGLIA, a port town of Italy, ſeventy miles ſouth-weſt of Genoa, ſubject to the king of Sardinia: E. long. 8° 30′, and north lat. 44°.

ONEIROCRITICA, the art of interpreting dreams, or predicting future events from dreams.

ONGAR, a market town of Eſſex, ten miles weſt of Chelmsford.

ONGLE'E, in heraldry, an appellation given to the talons or claws of beaſts or birds, when borne of a different colour from that of the body of the animal.

ONION. See Cepa.

ONISCUS, in zoology, a genus of inſects, belonging to the order of aptera. It has 14 feet, briſtly feelers, and an oval body. There are 17 ſpecies

ONKOTOMY, in ſurgery, the operation of opening a tumour or abſceſs. See Surgery.

ONOCLEA, in botany, a genus of the cryptogamia filices claſs: the fruit conſiſts of ſeveral globular capſules, with five valves and one cell, in which are ſeveral ſmall hairy ſeeds.

ONOCROTALUS, in ornithology. See Pelicanus.

ONOMANCY, a branch of divination, which foretels the good or bad fortune of a man, from the letters in his name.

From much the ſame principle the young Romans toaſted their miſtreſſes as often as there were letters in their names: hence Martial ſays,

Nævia ſex cyathis, ſeptem Juſtina bibatur.

ONOMATOPOEIA, in grammar and rhetoric, a figure where words are formed to reſemble the ſound made by the things ſignified; as the buz of bees, the cackling of hens, *&c.*

ONONIS, in botany, a genus of the diadelphia decandria claſs. The calix has five ſegments; the vexillum is ſtriated; and the pod is ſeſſile and turgid. There are 19 ſpecies, three of them natives of Britain, *viz.* the ſpinoſa, or reſt-harrow; the arvenſis, or corn reſt-harrow; and the repens, or creeping reſt-harrow.

ONOPORDUM, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is naked, and the ſcales of their calix are ſharp-pointed. There are four ſpecies, none of them natives of Britain.

ONTARIO, or Frontenac, a lace of North America: ſituated in W. long. 79°, and between 41° and 43° N. lat.

ONTOLOGY. See Metaphysics.

ONYX, in natural hiſtory, one of the ſemipellucid gems, with variouſly coloured zones, but none red; being compoſed of cryſtal, debaſed by a ſmall admixture of earth; and made up either of a number of flat plates, or of a ſeries of coats ſurrounding a central nucleus, and ſeparated from each other by veins of a different colour, reſembling zones or belts.

We have four ſpecies of this gem. 1. A bluiſh white one, with broad white zones. 2. A very pure onyx, with ſnow-white veins. 3. The jaſponyx, or horny onyx, with green zones. 4. The brown onyx, with bluiſh white zones.

OOST, a kiln for drying hops after they are picked from the ſtalks.

OOSTERGO, the north diviſion of Weſt Frieſland, one of the United Provinces.

OPACITY, in philoſophy, a quality of bodies which renders them impervious to the rays of light. See Optics.

OPAL, in natural hiſtory, a ſpecies of gems.

The opal is a gem of a peculiar kind, and has been eſteemed by many in all ages of very great value; though at preſent it is of leſs value, in proportion to its ſize, than any of the finer gems. It is ſofter than any other of the fine gems, and is difficult to poliſh to any degree of nicety. It is found of various ſhapes and ſizes: its moſt frequent bigneſs is between that of a pea and a horſe-bean; but it is found as ſmall as the head of a large pin, and has been ſeen of the ſize of a large walnut. Its figure is very various and uncertain, but it is never found in a cryſtalliform or columnar ſtate; its moſt uſual ſhape is an irregularly oblong one, convex above, flatted at bottom, and dented with various ſinuoſities at its ſides. It is often found among the looſe earth of mountains, ſometimes on the ſhores of rivers, and not unfrequently bedded in the coarſer kinds of jaſper.

It

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It is found in Egypt, Arabia, ſome parts of the Eaſt-Indies, and in many parts of Europe: thoſe of Europe are principally from Bohemia, and are of a greeniſh or greyiſh colour; the colour of other opals much reſembles the fineſt mother of pearl, its baſis ſeeming a bluiſh or greyiſh white, but with a property of reflecting all the colours of the rainbow, as turned differently to the light.

OPALIA, in antiquity, feaſts celebrated at Rome in honour of the goddeſs Ops. Varro ſays they were held on the nineteenth of December, which was one of the days of the Saturnalia: theſe two feaſts were celebrated in the ſame month, becauſe Saturn and Ops were huſband and wife: the vows offered to the goddeſs were made ſitting on the ground.

OPERA, a dramatic compoſition ſet to muſic, and ſung on the ſtage, accompanied with muſical inſtruments, and enriched with magnificent dreſſes, machines, and other decorations.

OPERATION, in general, the act of exerting or exerciſing ſome power or faculty, upon which an effect follows.

OPERATION, in chirurgery, denotes a methodical action of the hand on the human body, in order to reeſtabliſh health. See SURGERY.

OPERATOR, a perſon who performs an operation.

OPHIDIUM, in ichthyology, a genus belonging to the order of apodes. The head is ſomewhat naked; the teeth are in the jaws, palate, and fauces; there are ſeven rays in the gill membrane; and the body is ſhaped like a ſword. There are two ſpecies, *viz.* the barbatum, with four cirri; and the imberbe, which has no cirri, and the tail is blunt.

OPHIOGLOSSUM, in botany, a genus of the cryptogamia filices claſs. The ſpike is jointed. There are ſeven ſpecies, only one of which, *viz.* the vulgatum, or adders-tongue, is a native of Britain.

OPHIOMANCY, in antiquity, the art of making predictions from ſerpents. Thus Calchas, on ſeeing a ſerpent devour eight ſparrows with their dam, foretold the duration of the ſiege of Troy. And the ſeven quoils of a ſerpent that was ſeen on Anchiſes's tomb, were interpreted to mean the ſeven years that Æneas wandered from place to place before he arrived in Latium.

OPHIORHIZA, in botany, a genus of the pentandria monogynia claſs. The calix is funnel-ſhaped; the germen is bifid; it has two ſtigmata; and the fruit has two lobes; there are two ſpecies, none of them natives of Britain.

OPHIOXYLON, in botany, a genus of the polygamia monoecia claſs. The corolla and calix of the hermaphrodite conſiſts of five ſegments; it has five ſtamina, and one piſtillum: The calix of the male is bifid; the corolla is funnel-ſhaped, with a cylindrical nectarium near the inner edge, and conſiſts of five ſegments; it has only two ſtamina. There is but one ſpecies, a native of Ceylon.

OPHITES, in natural hiſtory, a ſort of variegated marble, of a duſky-green ground, ſprinkled with ſpots of a lighter green, otherwiſe called ſerpentine.

OPHITES, in church hiſtory, Chriſtian heretics, ſo called both from the veneration they had for the ſerpent that tempted Eve, and the worſhip they paid to a real ſerpent.

OPHRYS, in botany, a genus of the gynandria diandria claſs. The nectarium has a kind of carina on the under part. There are 18 ſpecies, eleven of which are natives of Britain

OPHTHALMIA, in medicine, an inflammation of the membranes which inveſt the eye; eſpecially of the adnata, or albugineous coat. See MEDICINE.

OPHTHALMIC NERVES. See ANATOMY, p. 248.

OPHTHALMOSCOPY, a branch of phyſiognomy, which deduces the knowledge of a man's temper and manners from the appearance of his eyes.

OPIATES, medicines of a thicker conſiſtence than a ſyrup, prepared with opium ſcarcely fluid. They conſiſt of various ingredients, made up with honey or ſyrup; and are to be uſed for a long time either for purgative, alterative, or corroborative intentions.

The word opiate is alſo uſed, in general, for any medicine given with an intention to procure ſleep, whether in the form of electuaries, drops, or pills.

OPINION, is defined to be an aſſent of the mind to propoſitions not evidently true at firſt ſight.

OPISTHOTONOS, in medicine, a kind of convulſion, wherein the body is bent backwards.

OPIUM, in the materia medica, is an inſpiſſated juice, partly of the reſinous, and partly of the gummy kind, brought to us in cakes from eight ounces to a pound weight. It is very heavy, of a denſe texture, and not perfectly dry; but, in general, eaſily receives an impreſſion from the finger: its colour is a browniſh yellow, ſo very dark and duſky that at firſt it appears black: it has a dead and faint ſmell, and its taſte is very bitter and acrid. It is to be choſen moderately firm, and not too ſoft; its ſmell and taſte ſhould be very ſtrong, and care is to be taken that there is no dirty or ſtony matter in it.

Opium is the juice of the papaver album, or white poppy, with which the fields of Aſia Minor are in many places ſown, as ours are with corn. When the heads are near ripening, they wound them with an inſtrument that has five edges, which on being ſtuck into the head makes at once five long cuts in it; and from theſe wounds the opium flows, and is next day taken off by a perſon who goes round the field, and put up in a veſſel which he carries faſtened to his girdle; at the ſame time that this opium is collected, the oppoſite ſide of the poppy head is wounded, and the opium collected from it the next day. They diſtinguiſh, however, the produce of the firſt wounds from that of the ſucceeding ones; for the firſt juice afforded by the plant is greatly ſuperior to what is obtained afterwards. After they have collected the opium, they moiſten it with a ſmall quantity of water or honey, and work it a long time upon a flat, hard, and ſmooth board, with a thick and ſtrong inſtrument of the ſame wood, till it becomes of the conſiſtence of pitch; and then work it up with their hands, and form it into cakes or rolls for ſale.

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Opium at preſent is in great eſteem, and is one of the moſt valuable of all the ſimple medicines. Applied externally, it is emollient, relaxing, and diſcutient, and greatly promotes ſuppuration: if long kept, upon the ſkin, it takes off the hair, and always occaſions an itching in it; ſometimes it exulcerates it, and raiſes little bliſters, if applied to a tender part: ſometimes, on external application, it allays pain, and even occaſions ſleep: but it muſt by no means be applied to the head, eſpecially to the ſutures of the ſkull; for it has been known to have the moſt terrible effects in this application, and even to bring on death itſelf. Opium, taken internally removes melancholy, eaſes pain, and diſpoſes to ſleep; in many caſes removes hæmorrhages, provokes ſweating. A moderate doſe is commonly under a grain; though, according to the circumſtances, two grains, or even three, may be within the limits of this denomination: but cuſtom will make people bear a dram or more; though in this caſe nature is vitiated, and nothing is to be hence judged in regard to others. If given diſſolved, it operates in half an hour; if in a ſolid form, as in pills, or the like, it is ſometimes an hour and a half. Its firſt effect, in this caſe, is the making the patient cheerful, as if he had drank moderately of wine, and at the ſame time bold and above the fear of danger; for which reaſon the Turks always take it when they are going to battle. A very immoderate doſe brings on a ſort of drunkenneſs, much like that occaſioned by an immoderate quantity of ſtrong liquors; cheerfulneſs and loud laughter at firſt, than a relaxation of the limbs, a loſs of memory, and lightheadedneſs; then vertigoes, dimneſs of the eyes, with a laxity of the cornea and a dilatation of the pupils, a ſlowneſs of the pulſe, redneſs of the face, relaxation of the under jaws, ſwelling of the lips, difficulty of breathing, painful erection of the penis, convulſions, cold ſweats, and finally death. Thoſe who eſcape are uſually relieved by a great number of ſtools, or profuſe ſweats.

Prepared opium, commonly called extract of opium, is made by diſſolving opium in a ſufficient quantity of water with a gentle heat; then ſtraining the ſolution from the fæces, and evaporating it to the conſiſtence of honey. Tincture of opium, or liquid laudanum, otherwiſe called the thebaic tincture, is made as follows: Take of prepared opium, two ounces; of cinnamon and cloves, each one drachm; of white-wine, one pint; infuſe them a week without heat, and then filtre it through paper.

OPOBALSAMUM, in the materia medica. See BALSAM.

OPOPANAX, in the materia medica, is a gum reſin of a tolerably firm texture, uſually brought to us in looſe granules or drops, and ſometimes in large maſſes, formed of a number of theſe connected by a quantity of matter of the ſame kind; but theſe are uſually loaded with extraneous matter, and are greatly inferior to the pure looſe kind. The drops or granules of the fine opopanax, are on the outſide of a browniſh red colour, and of a duſky yellowiſh or whitiſh colour within: they are of a ſomewhat unctuous appearance, ſmooth on the ſurface; and are to be choſen in clear pieces, of a ſtrong ſmell and acrid taſte.

Opopanax is attenuating and diſcutient, and is gently purgative; it diſpels flatulencies, and is good in aſthmas, in inveterate coughs, and in diſorders of the hand and nerves. It alſo promotes the menſes, and is good againſt all obſtructions of the viſcera.

OPOSSUM, in zoology. See DIDELPHIS.

OPPILATION, in medicine, the act of obſtructing or ſtopping up the paſſages of the body, by redundant or peccant humours. This word is chiefly uſed for obſtructions in the lower belly.

OPPONENT, a perſon who withſtands or oppoſes another.

OPPOSITION, in logic, the diſagreement between propoſitions which have the ſame ſubject and the ſame predicate.

OPTATIVE MOOD, in grammar, that which ſerves to expreſs an ardent deſire or wiſh for ſomething.

In moſt languages, except the Greek, the optative is only expreſſed by prefixing to the ſubjunctive an adverb of wiſhing; as *utinam*, in Latin; *plut a Dieu*, in French; and *would to God*, in Engliſh.

OPTERIA, in antiquity, preſents made by a bridegroom to his bride, when firſt conducted to him.

OPTICS.

THE cauſe and nature of viſion are properly the ſubject of that part of natural philoſophy which is called Optics: but as light is the cauſe of viſion, the word Optics is commonly uſed in a more extenſive ſenſe; and every thing is looked upon as a part of Optics which relates to the nature and qualities of light. If we uſe the word Optics, in the ſtricter ſenſe of it, for the theory of viſion, the ſcience of Optics is divided into two parts, *viz.* Dioptrics and Catoptrics. The laws of refraction, and the effects which the refraction of light has in viſion, are the ſubject of Dioptrics: The laws of reflection, and the effects which the reflection of light has in viſion, are the ſubject of Catoptrics. But this diviſion of Optics is of no uſe; for there are many propoſitions in Optics where both parts are mixed, and many that cannot be properly reduced to either; and therefore we ſhall not make any uſe of that diſtinction in the following Treatiſe.

Of LIGHT.

LIGHT conſiſts of an inconceivably great number of particles flowing from a luminous body in all manner of directions; and theſe particles are ſo ſmall, as to ſurpaſs all human comprehenſion.

That the number of particles of light is inconceivably great

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great, appears from the light of a candle; which, if there be no obſtacle in the way to obſtruct the paſſage of its rays, will fill all the ſpace within two miles of the candle every way with luminous particles, before it has loſt the leaſt ſenſible part of its ſubſtance.

A ray of light is a continued ſtream of theſe particles, flowing from any viſible body in a ſtraight line: and that the particles themſelves are incomprehenſibly ſmall, is manifeſt from the following experiment. Make a ſmall pin-hole in a piece of black paper, and hold the paper upright on a table facing a row of candles ſtanding by one another; then place a ſheet of paſteboard at a little diſtance behind the paper, and ſome of the rays which flow from all the candles through the hole in the paper, will form as many ſpecks of light on the paſteboard, as there are candles on the table before the plate: each ſpeck being as diſtinct and clear, as if there was only one ſpeck from one ſingle candle: which ſhews, that the particles of light are exceedingly ſmall, otherwiſe they could not paſs through the hole from ſo many different candles without confuſion —Dr Niewentyt has computed, that there flows more than 6,000,000,000,000 times as many particles of light from a candle in one ſecond of time, as there are grains of ſand in the whole earth, ſuppoſing each cubic inch of it to contain 1,000,000.

Theſe particles, by falling directly upon our eyes, excite in our minds the idea of light. And when they fall upon bodies, and are thereby reflected to our eyes, they excite in us the ideas of theſe bodies. And as every point of a viſible body reflects the rays of light in all manner of directions, every point will be viſible in every part to which the light is reflected from it. Thus the object *ABC* (Optical Plates, fig. n° 1.) is viſible to an eye in any part where the rays *Aa*, *Ab*, *Ac*, *Ad*, *Ae*, *Ba*, *Bb*, *Bc*, *Bd*, *Be*, and *Ca*, *Cb*, *Cc*, *Cd*, *Ce*, come. Here we have ſhewn the rays as if they were only reflected from the ends *A* and *B*, and from the middle point *C* of the object; every other point being ſuppoſed to reflect rays in the ſame manner. So that, where-ever a ſpectator is placed with regard to the body, every point of that part of the ſurface which is towards him will be viſible, when no intervening object ſtops the paſſage of the light.

Since no object can be ſeen through the bore of a bended pipe, it is evident that the rays of light move in ſtraight lines, whilſt there is nothing to refract or turn them out of their rectilineal courſe.

Whilſt the rays of light continue in any * medium of an uniform denſity, they are ſtraight; but when they paſs obliquely out of one medium into another which is either more denſe or more rare, they are refracted towards the denſer medium: and this refraction is more or leſs, as the rays fall more or leſs obliquely on the refracting ſurface which divides the mediums.

To prove this by experiment, ſet the empty veſſel *ABCD* (No. 2.) into any place where the ſun ſhines obliquely, and obſerve the part where the ſhadow of the edge *BC* falls on the bottom of the veſſel at *E*; then fill the veſſel with water, and the ſhadow will reach no farther than *e*; which ſhews, that the ray *aBE*, which came ſtraight in the open air, juſt over the edge of the veſſel at *B* to its bottom at *E*, is refracted by falling obliquely on the ſurface of the water at *B*: and inſtead of going on in the rectilineal direction *aBE*, it is bent downward in the water from *B* to *e*, the whole bend being at the ſurface of the water: and ſo of all other rays *abc*.

If a ſtick be laid over the veſſel, and the ſun's rays be reflected from a glaſs perpendicularly into the veſſel, the ſhadow of the ſtick will fall upon the ſame part of the bottom, whether the veſſel be empty or full; which ſhews that the rays of light are not refracted when they fall perpendicularly on the ſurface of any medium.

The rays of light are as much refracted by paſſing out of water into air, as by paſſing out of air into water. Thus, if a ray of light flows from the point *e*, under water, in the direction *eB*; when it comes to the ſurface of the water at *B*, it will not go on thence in the rectilineal courſe *Bd*, but will be refracted into the line *Ba*. Therefore,

To an eye at *e* looking through a plane glaſs in the bottom of the empty veſſel, the point *a* cannot be ſeen, becauſe the ſide *Bc* of the veſſel interpoſes; and the point *d* will juſt be ſeen over the edge of the veſſel at *B*. But if the veſſel be filled with water, the point *a* will be ſeen from *e*; and will appear as at *d*, elevated in the direction of the ray *eB*. Hence a piece of money lying at *e*, in the bottom of an empty veſſel; cannot be ſeen by an eye at *a*, becauſe the edge of the veſſel intervenes; but let the veſſel be filled with water, and the ray *ea* being then refracted at *B*, will ſtrike the eye at *a*, and ſo render the money viſible, which will appear as if it were raiſed up to *f* in the line *aBf*.

The time of ſun-riſing or ſetting, ſuppoſing its rays ſuffered no refraction, is eaſily found by calculation. But obſervation proves, that the ſun riſes ſooner and ſets later every day than the calculated time; the reaſon of which is plain, from what was ſaid immediately above. For, though the ſun's rays do not come part of the way to us through water, yet they do through the air or atmoſphere, which being a groſſer medium than the free ſpace between the ſun and the top of the atmoſphere, the rays, by entering obliquely into the atmoſphere, are there refracted, and thence bent down to the earth. And although there are many places of the earth to which the ſun is vertical at noon, and conſequently his rays can ſuffer no refraction at that time, becauſe they come perpendicularly through the atmoſphere; yet there is no place to which the ſun's rays do not fall obliquely on the top of the atmoſphere, at his riſing and ſetting; and conſequently, no clear day in which the ſun will not be viſible before he riſes in the horizon, and after he ſets in it; and the longer or ſhorter, as the atmoſphere is more or leſs replete with vapours. For, let *ABC*, (No. 3.) be part of the earth's ſurface, *DEF* the atmoſphere that covers it, and *EBGH* the ſenſible horizon of an obſerver at *B*. As every point of the ſun's ſurface ſends out rays of light in all manner of directions, ſome of his rays will conſtantly fall upon, and enlighten, ſome half of our atmoſphere; and

* Any thing through which the rays of light can paſs, is called a medium; as air, water, glaſs, diamond, or even a vacuum.

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and therefore, when the ſun is at *I*, below the horizon *H*, thoſe rays which go on in the free ſpace *IkK* preſerve a rectilineal courſe until they fall upon the top of the atmoſphere; and thoſe which fall ſo about *K*, are refracted at their entrance into the atmoſphere, and bent down in the line *KmB*, to the obſerver's place at *B*: and therefore, to him the ſun will appear at *L*, in the direction of the ray *BmK*, above the horizon *BGH*, when he is really below it at *I*.

The angle contained between a ray of light, and a perpendicular to the refracting ſurface, is called *the angle of incidence*; and the angle contained between the ſame perpendicular, and the ſame ray after refraction, is called *the angle of refraction*. Thus (No. 4.) let *LBM* be the refracting ſurface of a medium (ſuppoſe water,) and *ABC* a perpendicular to that ſurface; let *DB* be a ray of light, going out of air into water at *B*, and therein refracted in the line *BH*: the angle *ABD*, is the angle of incidence, of which *DF* is the ſine; and the angle *KBH* is the angle of refraction, whoſe ſine is *KI*.

When the refracting medium is water, the ſine of the angle of incidence is to the ſine of the angle of refraction as 4 to 3; which is confirmed by the following experiment, taken from Doctor SMITH's Optics.

Deſcribe the circle *DAEC* on a plane ſquare board, and croſs it at right angles with the ſtraight lines *ABC*, and *LBM*; then, from the interſection *A*, with any opening of the compaſſes, ſet off the equal arcs *AD* and *AE*, and draw the right line *DFE*: then, taking *Fa*, which is three quarters of the length *FE*, from the point *a*, draw *aI* parallel to *ABK*, and join *KI* parallel to *BM*: ſo *KI* will be equal to three quarters of *FE* or of *DF*. This done, fix the board upright upon the leaden pedeſtal *O*, and ſtick three pins perpendicularly into the board, at the points *D*, *B*, and *I*: then ſet the board upright into the veſſel *TUV*, and fill up the veſſel with water to the line *LBM*. When the water has ſettled, look along the line *DB*, ſo as you may ſee the head of the pin *B* over the head of the pin *D*; and the pin *I* will appear in the ſame right line produced to G, for its head will be ſeen juſt over the head of the pin at *B*: which ſhews that the ray *IB*, coming from the pin at *I*, is ſo refracted at *B*, as to proceed from thence in the line *BD* to the eye of the obſerver; the ſame as it would do from any point *G* in the right line *DBG*, if there were no water in the veſſel: and alſo ſhews, that *KI*, the ſine of refraction in water, is to *DF*, the ſine of incidence in air, as 3 to 4.

Hence, if *DBH* were a crooked ſtick put obliquely into the water, it would appear a ſtraight one at *DBG*. Therefore, as the line *BH* appears at *BG*, ſo the line *BG* will appear at *Bg*; and conſequently, a ſtraight ſtick *DBG* put obliquely into water, will ſeem bent at the ſurface of the water in *B*, and crooked, as *DBg*.

When a ray of light paſſes out of air into glaſs, the ſine of incidence is to the ſine of refraction as 3 to 2; and when out of air into a diamond, as 5 to 2.

Of GLASSES.

GLASS may be ground into eight different ſhapes at leaſt, for optical purpoſes, *viz.*

1. A *plane glaſs*, (No. 5.) which is flat on both ſides, and of equal thickneſs in all parts, as *A*.

2. A *plano-convex*, which is flat on one ſide, and convex on the other, as *B*.

3. A *double-convex*, which is convex on both ſides, as *C*.

4. A *plano-concave*, which is flat on one ſide, and concave on the other, as *D*.

5. A *double concave*, which is concave on both ſides, as *E*.

6. A *meniſcus*, which is concave on one ſide, and convex on the other, as *F*.

7. A *flat plano-convex*, whoſe convex ſide is ground into ſeveral little flat ſurfaces, as *G*.

8. A *priſm*, which has three flat ſides; and when viewed endwiſe, appears like an equilateral triangle, as *H*.

Glaſſes ground into any of the ſhapes *B*, *C*, *D*, *E*, *F*, are generally called *lenſes*.

A right line *LIK*, (No. 6.) going perpendicularly through the middle of a lens, is called *the axis of the lens*.

A ray of light *Gb*, falling perpendicularly on a plane glaſs *EF*, will paſs through the glaſs in the ſame direction *bi*, and go out of it into the air in the ſame right courſe *iH*.

A ray of light *AB*, falling obliquely on a plane glaſs, will go out of the glaſs in the ſame direction, but not in the ſame right line: for in touching the glaſs, it will be refracted in the line *BC*; and in leaving the glaſs, it will be refracted in the line *CD*.

A ray of light *CD*, (No. 7.) falling obliquely on the middle of a convex glaſs, will go forward in the ſame direction *DE*, as if it had fallen with the ſame degree of obliquity on a plane glaſs; and will go out of the glaſs in the ſame direction with which it entered: for it will be equally refracted at the points *D* and *E*, as if it had paſſed through a plane ſurface. But the rays *CG* and *CI* will be ſo refracted, as to meet again at the point *F*. Therefore, all the rays which flow from the point *C*, ſo as to go through the glaſs, will meet again at *F*; and if they go farther onward, as to *L*, they croſs at *F*, and go forward on the oppoſite ſides of the middle ray *CDEF*, to what they were in approaching it in the directions *HF* and *KF*.

When parallel rays, as *ABC*, (No. 8.) fall directly upon a plano-convex glaſs *DE*, and paſs through it, they will be ſo refracted, as to unite in a point *f* behind it; and this point is called the *principal focus*; the diſtance of which, from the middle of the glaſs, is called the *focal diſtance*, which is equal to twice the radius of the ſphere of the glaſs's convexity. And,

When parallel rays, as *ABC*, (No. 9.) fall directly upon a glaſs *DE*, which is equally convex on both ſides, and paſs through it; they will be ſo refracted, as to meet in a point or principal focus *f*, whoſe diſtance is equal to the radius or ſemidiameter of the ſphere of the glaſs's convexity. But if a glaſs be more convex on one ſide than on the other, the rule for finding the focal diſtance is this: As the ſum of the ſemidiameters of both convexities is to the ſemidiameter of either, ſo is double the ſemidiameter

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ſemidiameter of the other to the diſtance of the focus. Or, divide the double product of the radii by their ſum, and the quotient will be the diſtance ſought.

Since all thoſe rays of the ſun which paſs through a convex glaſs are collected together in its focus, the force of all their heat is collected into that part; and is in proportion to the common heat of the ſun, as the area of the glaſs to the area of the focus. Hence we ſee the reaſon why a convex glaſs cauſes the ſun's rays to burn after paſſing through it.

All theſe rays croſs the middle ray in the focus *f*, and then diverge from it, to the contrary ſides, in the ſame manner *FfG*, as they converged in the ſpace *DfE* in coming to it.

If another glaſs *FG*, of the ſame convexity as *DE*, be placed in the rays at the ſame diſtance from the focus, it will refract them ſo, as that, after going out of it, they will be all parallel, as *abc*; and go on in the ſame manner as they came to the firſt glaſs *DE*, through the ſpace *ABC*; but on the contrary ſides of the middle ray *Bfb*: for the ray *ADf* will go on from *f* in the direction *fGa*, and the ray *CEf* in the direction *fFc*; and ſo of the reſt.

The rays diverge from any radiant point, as from a principal focus: therefore if a candle be placed at *f*, in the focus of the convex glaſs *FG*, the diverging rays in the ſpace *EfG* will be ſo refracted by the glaſs, as that, after going out of it, they will become parallel, as ſhewn in the ſpace *cba*.

If the candle be placed nearer the glaſs than its focal diſtance, the rays will converge after paſſing through the glaſs more or leſs as the candle is more or leſs diſtant from the focus.

If the candle be placed farther from the glaſs than its focal diſtance, the rays will converge after paſſing thro' the glaſs, and meet in a point, which will be more or leſs diſtant from the glaſs as the candle is nearer to or farther from its focus: and where the rays meet, they will form an inverted image of the flame of the candle; which may be ſeen on a paper placed in the meeting of the rays.

Hence, if any object *ABC* (No. 10.) be placed beyond the focus *F* of the convex glaſs *def*, ſome of the rays which flow from every point of the object, on the ſide next the glaſs, will fall upon it; and after paſſing through it, they will be converged into as many points on the oppoſite ſide of the glaſs, where the image of every point will be formed, and conſequently the image of the whole object, which will be inverted. Thus, the rays *Ad*, *Ae*, *Af*, flowing from the point *A*, will converge in the ſpace *daf*, and by meeting at *a* will there form the image of the point *A*. The rays *Bb*, *Be*, *Bf*, flowing from the point *B*, will be united at *b* by the refraction of the glaſs, and will there form the image of the point *B*. And the rays *Cd*, *Ce*, *Cf*, flowing from the point *C*, will be united at *c*, where they will form the image of the point *C*. And ſo of all the other intermediate points between *A* and *C*. The rays which flow from every particular point of the object, and are united again by the glaſs, are called *pencils of rays*.

If the object *ABC* be brought nearer to the glaſs, the picture *abc* will be removed to a greater diſtance. For then more rays flowing from every ſingle point, will all more diverging upon the glaſs; and therefore cannot be ſo ſoon collected into the correſponding points behind it. Conſequently, if the diſtance of the object *ABC* (No 11.) be equal to the diſtance *eB* of the focus of the glaſs, the rays of each pencil will be ſo refracted by paſſing through the glaſs, that they will go out of it parallel to each other; as *dI*, *eH*, *fh*, from the point *C*; *dG*, *eK*, *fD*, from the point *B*; and *dK*, *eE*, *fL*, from the point *A*: and therefore, there will be no picture formed behind the glaſs.

If the focal diſtance of the glaſs, and the diſtance of the object from the glaſs, be known, the diſtance of the picture from the glaſs may be found by this rule, *viz.* Multiply the diſtance of the focus by the diſtance of the object, and divide the product by the difference; the quotient will be the diſtance of the picture.

The picture will be as much bigger or leſs than the object, as its diſtance from the glaſs is greater or leſs than the diſtance of the object. For, as *Be* (No. 10.) is to *eB*, ſo is *AC* to *ca*. So that if *ABC* be the object, *cba* will be the picture; or if *cba* be the object, *ABC* will be the picture.

Having deſcribed how the rays of light, flowing from objects and paſſing through convex glaſſes, are collected into points, and form the images of the objects; it will be eaſy to underſtand how the rays are affected by paſſing through the humours of the eye, and are thereby collected into innumerable points on the bottom of the eye, and thereon form the images of the objects which they flow from. For, the different humours of the eye, and particularly the chryſtalline humour, are to be conſidered as a convex glaſs; and the rays in paſſing through them to be affected in the ſame manner as in paſſing through a convex glaſs.—For a deſcription of the coats and tumours of the eye, ſee ANATOMY, p. 289.

As every point of an object *ABC*, (No. 12.) ſends out rays in all directions, ſome rays, from every point on the ſide next the eye, will fall upon the cornea between *E* and *F*; and by paſſing on through the humours and pupil of the eye, they will be converged to as many points on the retina or bottom of the eye, and will thereon form a diſtinct inverted picture *cba* of the object. Thus, the pencil of rays *qrs* that flows from the point *A* of the object, will be converged to the point *a* on the retina; thoſe from the point *B* will be converged to the point *b*; thoſe from the point *C* will be converged to the point *c*; and ſo of all the intermediate points; by which means the whole image *abc* is formed, and the object made viſible: although it muſt be owned, that the method by which this ſenſation is carried from the eye by the optic nerve to the common ſenſory in the brain, and there diſcerned, is above the reach of our comprehenſion.

But that viſion is effected in this manner, may be demonſtrated experimentally. Take a bullock's eye whilſt it is freſh, and having cut off the three coats from the back part, quite to the vitreous humour, put a piece of white paper over that part, and hold the eye towards any bright object, and you will ſee an inverted picture of the object upon the paper.

Since the image is inverted, many have wondered why the object appears upright. But we are to conſider, 1. That *inverted* is only a relative term; and, 2. That

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there is a very great difference between the real object and the means or image by which we perceive it. When all the parts of a diſtant proſpect are painted upon the retina, they are all right with reſpect to one another, as well as the parts of the proſpect itſelf; and we can only judge of an object's being inverted, when it is turned reverſe to its natural poſition with reſpect to other objects which we ſee and compare it with.—If we lay hold of an upright ſtick in the dark, we can tell which is the upper or lower part of it, by moving our hand downward or upward; and know very well that we cannot feel the upper end by moving our hand downward. Juſt ſo we find by experience, that upon directing our eyes towards a tall object, we cannot ſee its top by turning our eyes downward, nor its foot by turning our eyes upward; but muſt trace the object the ſame way by the eye to ſee it from head to foot, as we do by the hand to feel it; and as the judgment is informed by the motion of the hand in one caſe, ſo it is alſo by the motion of the eye in the other.

In (No. 13.) is exhibited the manner of ſeeing the ſame object *ABC*, by both the eyes *D* and *E* at once.

When any part of the image *cba* falls upon the optic nerve *L*, the correſponding part of the object becomes inviſible. On which account, nature has wiſely placed the optic nerve of each eye, not in the middle of the bottom of the eye, but towards the ſide next the noſe; ſo that whatever part of the image falls upon the optic nerve of one eye, may not fall upon the optic nerve of the other. Thus the point *a* of the image *cba* falls upon the optic nerve of the eye *D*, but not of the eye *E*; and the point *c* falls upon the optic nerve of the eye *E*, but not of the eye *D*: and therefore, to both eyes taken together, the whole object *ABC* is viſible.

The nearer that any object is to the eye, the larger is the angle under which it is ſeen, and the magnitude under which it appears. Thus to the eye *D*, (No. 14.) the object *ABC* is ſeen under the angle *APC*; and its image *cba* is very large upon the retina: but to the eye *E*, at a double diſtance, the ſame object is ſeen under the angle *AqC*, which is equal only to half the angle *APC*, as is evident by the figure. The image *cba* is likewiſe twice as large in the eye *D*, as the other image *cba* is in the eye *E*. In both theſe repreſentations, a part of the image falls on the optic nerve, and the object in the correſponding part is inviſible.

As the ſenſe of ſeeing is allowed to be occaſioned by the impulſe of the rays from the viſible object upon the retina of the eye, and forming the image of the object thereon, and that the retina is only the expanſion of the optic nerve all over the choroides; it ſhould ſeem ſurpriſing, that the part of the image which falls on the optic nerve ſhould render the like part of the object inviſible; eſpecially as that nerve is allowed to be the inſtrument by which the impulſe and image are conveyed to the common ſenſory in the brain. But this difficulty vaniſhes, when we conſider that there is an artery within the trunk of the optic nerve, which entirely obſcures the image in that part, and conveys no ſenſation to the brain.

That the part of the image which falls upon the middle of the optic nerve is loſt, and conſequently the correſponding part of the object is rendered inviſible, is plain by experiment. For, if a perſon fixes three patches, *A*, *B*, *C*, (No. 15.) upon a white wall, at the height of the eye, and the diſtance of about a foot from each other, and places himſelf before them, ſhutting the right eye, and directing the left towards the patch *C*, he will ſee the patches *A* and *C*, but the middle patch *B* will diſappear. Or, if he ſhuts his left eye, and directs the right towards *A*, he will ſee both *A* and *C*, but *B* will diſappear; and if he directs his eye towards *B*, he will ſee both *B* and *A*, but not *C*. For whatever patch is directly oppoſite to the optic nerve N, vaniſhes. This requires a little practice, after which he will find it eaſy to direct his eye, ſo as to loſe the ſight of whichever patch he pleaſes.

We are not commonly ſenſible of this diſappearance, becauſe the motions of the eye are ſo quick and inſtantaneous, that we no ſooner loſe the ſight of any part of an object, than we recover it again; much the ſame as in the twinkling of our eyes; for at each twinkling we are blinded; but it is ſo ſoon over, that we are ſcarce ever ſenſible of it.

Some eyes require the aſſiſtance of convex glaſſes to make them ſee objects diſtinctly, and others of concave. If either the cornea *abc*, (No. 16.) or chryſtalline humour *e*, or both of them, be too flat, as in the eye *A*, their focus will not be on the retina, as at *d*, where it ought to be, in order to render viſion diſtinct; but beyond the eye, as at *f*. And therefore, thoſe rays which flow from the object *C*, and paſs through the humours of the eye, are not converged enough to unite at *d*; and therefore the obſerver can have but a very indiſtinct view of the object. This is remedied by placing a convex glaſs *gh* before the eye, which makes the rays converge ſooner, and imprints the image duly on the retina at *d*.

If either the cornea, or chryſtalline humour, or both of them, be too convex, as in the eye *B*, the rays that enter it from the object *C*, will be converged to a focus in the vitreous humour, as at *f*, and by diverging from thence to the retina, will form a very confuſed image thereon: and ſo, of courſe, the obſerver will have as confuſed a view of the object, as if his eye had been too flat. This inconvenience is remedied by placing a concave glaſs *gh* before the eye; which glaſs, by cauſing the rays to diverge between it and the eye, lengthens the focal diſtance ſo; that if the glaſs be properly choſen, the rays will unite at the retina, and form a diſtinct picture of the object upon it.

Such eyes as have their humours of a due convexity, cannot ſee any object diſtinctly at a leſs diſtance than ſix inches; and there are numberleſs objects too ſmall to be ſeen at that diſtance, becauſe they cannot appear under any ſenſible angle. The method of viewing ſuch minute objects is by a *microſcope*; of which there are three ſorts, *viz.* the *ſingle*, the *double*, and the *ſolar*.

Of MICROSCOPES.

THE *ſingle microſcope* is only a ſmall convex glaſs, as *cd*, (No. 17.) having the object *ab* placed in its focus, and the eye at the ſame diſtance on the other ſide; ſo that the rays of each pencil, flowing from every point of the object on the ſide next the glaſs, may go on parallel

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rallel to the eye after paſſing through the glaſs; and then, by entering the eye at *C*, they will be converged to as many different points on the retina, and form a large inverted picture *AB* upon it, as in the figure.

To find how much this glaſs magnifies, divide the leaſt diſtance (which is about ſix inches) at which an object can be ſeen diſtinctly with the bare eye, by the focal diſtance of the glaſs; and the quotient will ſhew how much the glaſs magnifies the diameter of the object.

The *double* or *compound microſcope*, (No. 18.) conſiſts of an object-glaſs *cd*, and an eye-glaſs *ef*. The ſmall object *ab* is placed at a little greater diſtance from the glaſs *cd* than its principal focus, ſo that the pencils of rays flowing from the different points of the object, and paſſing through the glaſs, may be made to converge and unite in as many points between *g* and *h*, where the image of the object will be formed: which image is viewed by the eye through the eye-glaſs *ef*. For the eye-glaſs being ſo placed, that the image *gh* may be in its focus, and the eye much about the ſame diſtance on the other ſide, the rays of each pencil will be parallel, after going out of the eye-glaſs, as at *e* and *f*, till they come to the eye at *k*, where they will begin to converge by the refractive power of the humours; and after having croſſed each other in the pupil, and paſſed through the chryſtalline and vitreous humours, they will be collected into points on the retina, and form the large inverted image *AB* thereon.

The magnifying power of this microſcope is as follows. Suppoſe the image *gh* to be ſix times the diſtance of the object *ab* from the object-glaſs *cd*; then will the image be ſix times the length of the object: but ſince the image could not be ſeen diſtinctly by the bare eye at a leſs diſtance than ſix inches, if it be viewed by an eye-glaſs *ef*, of one inch focus, it will thereby be brought ſix times nearer the eye; and conſequently viewed under an angle ſix times as large as before; ſo that it will be again magnified ſix times; that is, ſix times by the object-glaſs, and ſix times by the eye-glaſs; which multiplied into one another, makes 36 times; and ſo much is the object magnified in diameter more than what it appears to the bare eye; and conſequently 36 times 36, or 1296 times, in ſurface.

But, becauſe the extent or field of view is very ſmall in this microſcope, there are generally two eye-glaſſes placed ſometimes cloſe together, and ſometimes an inch aſunder; by which means, although the object appears leſs magnified, yet the viſible area is much enlarged by the interpoſition of a ſecond eye-glaſs, and conſequently a much pleaſanter view is obtained.

The *ſolar microſcope*, (No. 19.) invented by Dr Lieberkhun, is conſtructed in the following manner. Having procured a very dark room, let a round hole be made in the window-ſhutter, about three inches diameter, through which the ſun may caſt a cylinder of rays *AA* into the room. In this hole, place the end of a tube, containing two convex glaſſes and an object, *viz.* 1. A convex glaſs *aa*, of about two inches diameter, and three inches focal diſtance, is to be placed in that end of the tube which is put into the hole. 2. The object *bb*, being put between two glaſſes (which muſt be concave to hold it at liberty) is placed about two inches and a half from the glaſs *aa*. 3. A little more than a quarter of an inch from the object is placed the ſmall convex glaſs *cc*, whoſe focal diſtance is a quarter of an inch.

The tube may be ſo placed, when the ſun is low, that his rays *AA* may enter directly into it: but when he is high, his rays *BB* muſt be reflected into the tube by the plane mirrour or looking glaſs *CC*.

Things being thus prepared, the rays that enter the tube will be conveyed by the glaſs *aa* towards the object *bb*, by which means it will be ſtrongly illuminated; and the rays *d* which flow from it through the convex glaſs *cc*, will make a large inverted picture of the object at *DD*; which, being received on a white paper, will repreſent the object magnified in length, in proportion of the diſtance of the picture from the glaſs *cc*, to the diſtance of the object from the ſame glaſs. Thus, ſuppoſe the diſtance of the object from the glaſs to be $\frac{1}{10}$ parts of an inch, and the diſtance of the diſtinct picture to be 12 feet or 144 inches, in which there are 1440 tenths of an inch; and this number divided by 3 tenths, gives 480; which is the number of times the picture is longer or broader than the object; and the length multiplied by the breadth, ſhews how much the whole ſurface is magnified.

Of Teleſcopes.

Before we enter upon the deſcription of teleſcopes, it will be proper to ſhew how the rays of light are affected by paſſing through concave glaſſes, and alſo by falling upon concave mirrours.

When parallel rays, as *abcdefgh*, (No. 20.) paſs directly through a glaſs *AB*, which is equally concave on both ſides, they will diverge after paſſing through the glaſs, as if they had come from a radiant point *C*, in the centre of the glaſs's concavity; which point is called the negative or virtual focus of the glaſs. Thus the ray *a*, after paſſing through the glaſs *AB*, will go on in the direction *kl*, as if it had proceeded from the point *C*, and no glaſs been in the way. The ray *b* will go on in the direction *mn*; the ray *c* in the direction *op*, &c.—The ray *C*, that falls directly upon the middle of the glaſs, ſuffers no refraction in paſſing through it; but goes on in the ſame rectilineal direction, as if no glaſs had been in its way.

If the glaſs had been concave only on one ſide, and the other ſide quite plane, the rays would have diverged, after paſſing through it, as if they had come from a radiant point at double the diſtance of *C* from the glaſs; that is, as if the radiant had been at the diſtance of a whole diameter of the glaſs's concavity.

If rays come more converging to ſuch a glaſs, than parallel rays diverge after paſſing through it, they will continue to converge after paſſing through it; but will not meet ſo ſoon as if no glaſs had been in the way, and will incline towards the ſame ſide to which they would have diverged if they had come parallel to the glaſs. Thus the rays *f* and *h*, going in a converging ſtate towards the edge of the glaſs at *B*, and converging more in their way to it than the parallel rays diverge after paſſing through it, they will go on converging after they paſs through it, though

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though in a leſs degree than they did before, and will meet at *f*: but if no glaſs has been in their way, they would have met at *i*.

When parallel rays, (No. 21.) as *dfa*, *Cmb*, *elc*, fall upon a concave mirrour *AB* (which is not tranſparent, but has only the ſurface *AbB* of a clear poliſh.) they will be reflected back from that mirrour, and meet in a point *m*, at half the diſtance of the ſurface of the mirrour from *C* the centre of its concavity; for they will be reflected at as great an angle from a perpendicular to the ſurface of the mirrour, as they fell upon it with regard to that perpendicular, but on the other ſide thereof. Thus, let *C* be the centre of concavity of the mirrour *AbB*; and let the parallel rays *dfa*, *Cmb*, and *elc*, fall upon it at the points *a*, *b*, and *c*. Draw the lines *Cia*, *Cmb*, and *Chc*, from the centre *C* to theſe points; and all theſe lines will be perpendicular to the ſurface of the mirrour, becauſe they proceed thereto like ſo many radii or ſpokes from its centre. Make the angle *Cah* equal to the angle *daC*, and draw the line *amb*, which will be the direction of the ray *dfa*, after it is reflected from the point *a* of the mirrour; ſo that the angle of incidence *daC*, is equal to the angle of reflection *Cah*; the rays making equal angles with the perpendicular *Cia* on its oppoſite ſides.

Draw alſo the perpendicular *Chc* to the point *c*, where the ray *elc* touches the mirrour; and, having made the angle *Cci* equal to the angle *Cce*, draw the line *cmi*, which will be the courſe of the ray *elc*, after it is reflected from the mirrour.

The ray *Cmb* paſſing through the centre of concavity of the mirrour, and falling upon it at *b*, is perpendicular to it; and is therefore reflected back from it in the ſame line *bmC*.

All theſe reflected rays meet in the point *m*; and in that point the image of the body which emits the parallel rays *da*, *Cb*, and *ec*, will be formed; which point is diſtant from the mirrour equal to half the radius *bmC* of its concavity.

The rays which proceed from any celeſtial object may be eſteemed parallel at the earth; and therefore, the images of that object will be formed at *m*, when the reflecting ſurface of the concave mirrour is turned directly towards the object. Hence, the focus *m* of parallel rays is not in the centre of the mirrour's concavity, but half way between the mirrour and that centre.

The rays which proceed from any remote terreſtrial object, are nearly parallel at the mirrour; not ſtrictly ſo, but come diverging to it, in ſeparate pencils, or, as it were, bundles of rays, from each point of the ſide of the object next the mirrour; and therefore they will not be converged to a point at the diſtance of half the radius of the mirrour's concavity from its reflecting ſurface, but into ſeparate points at a little greater diſtance from the mirrour. And the nearer the object is to the mirrour, the farther theſe points will be from it; and an inverted image of the object will be formed in them, which will ſeem to hang pendant in the air; and will be ſeen by an eye placed beyond it (with regard to the mirrour) in all reſpects like the object, and as diſtinct as the object itſelf.

Let *AcB*, (No. 22.) be the reflecting ſurface of a mirrour, whoſe centre of concavity is at *C*; and let the upright object *DE* be placed beyond the centre *C*, and ſend out a conical pencil of diverging rays from its upper extremity *D*, to every point of the concave ſurface of the mirrour *AcB*. But to avoid confuſion, we only draw three rays of that pencil, as *DA*, *Dc*, *DB*.

From the centre of concavity *C*, draw the three right lines *CA*, *Cc*, *CB*, touching the mirrour in the ſame points where the foreſaid rays touch it; and all theſe lines will be perpendicular to the ſurface of the mirrour. Make the angle *CAd* equal to the angle *DAC*, and draw the right line *Ad* for the courſe of the reflected ray *DA*: make the angle *Ccd* equal to the angle *DcC*, and draw the right line *cd* for the courſe of the reflected ray, *Dd*: make alſo the angle *CBd* equal to the angle *DBC*, and draw the right line *Bb* for the courſe of the reflected ray *DB*. All theſe reflected rays will meet in the point *d*, where they will form the extremity *d* of the inverted image *ed*, ſimilar to the extremity *D* of the upright object *DE*.

If the pencil of rays *Eg*, *Eb*, be alſo continued to the mirrour, and their angles of reflection from it be made equal to their angles of incidence upon it, as in the former pencil from *D*, they will all meet at the point *e* by reflection, and form the extremity *e* of the image *ed*, ſimilar to the extremity *E* of the object *DE*.

And as each intermediate point of the object, between *D* and *E*, ſends out a pencil of rays in like manner to every part of the mirrour, the rays of each pencil will be reflected back from it, and meet in all the intermediate points between the extremities *e* and *d* of the image; and ſo the whole image will be formed, not at *i*, half the diſtance of the mirrour from its centre of concavity *C*; but at a greater diſtance, between *i* and the object *DE*; and the image will be inverted with reſpect to the object.

This being well underſtood, the reader will eaſily ſee how the image is formed by the large concave mirrour of the reflecting teleſcope, when he comes to the deſcription of that inſtrument.

When the object is more remote from the mirrour than its centre of concavity *C*, the image will be leſs than the object, and between the object and mirrour: when the object is nearer than the centre of concavity, the image will be more remote and bigger than the object: thus, if *DE* be the object, *ed* will be its image: for, as the object recedes from the mirrour, the image approaches nearer to it; and as the object approaches nearer to the mirrour, the image recedes farther from it; on account of the leſſer or greater divergency of the pencils of rays which proceed from the object: for, the leſs they diverge, the ſooner they are converged to points by reflection; and the more they diverge, the farther they muſt be reflected before they meet.

If the radius of the mirrour's concavity, and the diſtance of the object from it, be known, the diſtance of the image from the mirrour is found by this rule; Divide the product of the diſtance and radius by double the diſtance made leſs by the radius, and the quotient is the diſtance required.

If the object be in the centre of the mirrour's concavity,

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cavity, the image and object will be coincident, and equal in bulk.

If a man places himſelf directly before a large concave mirrour, but farther from it than its centre of concavity, he will ſee an inverted image of himſelf in the air, between him and the mirrour, of a leſs ſize than himſelf. And if he holds out his hand towards the mirrour, the hand of the image will come out towards his hand, and coincide with it, of an equal bulk, when his hand is in the centre of concavity; and he will imagine he may ſhake hands with his image. If he reaches his hand farther, the hand of the image will paſs by his hand, and come between his hand and his body: and if he moves his hand towards either ſide, the hand of the image will move towards the other; ſo that whatever way the object moves, the image will move the contrary.

All the while a by-ſtander will ſee nothing of the image, becauſe none of the reflected rays that form it enter his eyes.

If a fire be made in a large room, and a ſmooth mahogony table be placed at a good diſtance near the wall, before a large concave mirrour, ſo placed, that the light of the fire may be reflected from the mirrour to its focus upon the table; if a perſon ſtands by the table, he will ſee nothing upon it but a longiſh beam of light: but if he ſtands at a diſtance towards the fire, not directly between the fire and mirrour, he will ſee an image of the fire upon the table, large and erect. And if another perſon, who knows nothing of this matter before-hand, ſhould chance to come into the room, and ſhould look from the fire towards the table, he would be ſtartled at the appearance; for the table would ſeem to be on fire, and, by being near the wainſcot, to endanger the whole houſe. In this experiment, there ſhould be no light in the room but what proceeds from the fire; and the mirrour ought to be at leaſt fifteen inches in diameter.

If the fire be darkened by a ſcreen, and a large candle be placed at the back of the ſcreen; a perſon ſtanding by the candle will ſee the appearance of a fine large ſtar, or rather planet, upon the table, as bright as Venus or Jupiter. And if a ſmall wax taper (whoſe flame is much leſs than the flame of the candle) be placed near the candle, a ſatellite to the planet will appear on the table: and if the taper be moved round the candle, the ſatellite will go round the planet.

In a *refracting teleſcope*, the glaſs which is neareſt the object in viewing it is called the *object-glaſs*, and that which is neareſt the eye is called *the eye-glaſs*. The object-glaſs muſt be convex, but the eye-glaſs may be either convex or concave: and generally, in looking through a teleſcope, the eye is in the focus of the eye-glaſs; though that is not very material: for the diſtance of the eye, as to diſtinct viſion, is indifferent, provided the rays of the pencils fall upon it parallel: only, the nearer the eye is to the end of the teleſcope, the larger is the ſcope or area of the field of view,

Let *cd* (No. 23.) be a convex glaſs fixed in a long tube, and have its focus at *E*. Then, a pencil of rays *ghi*, flowing from the upper extremity *A* of the remote object *AB*, will be ſo refracted by paſſing through the glaſs, as to converge and meet in the point *f*; whilſt the pencil of rays *klm*, flowing from the lower extremity *B* of the ſame object *AB*, and paſſing through the glaſs, will converge and meet in the point *e*: and the images of the points *A* and *B* will be formed in the points *f* and *e*. And as all the intermediate points of the object, between *A* and *B*, ſend out pencils of rays in the ſame manner, a ſufficient number of theſe pencils will paſs through the object-glaſs *cd*, and converge to as many intermediate points between *e* and *f*; and ſo will form the whole inverted image *eEf* of the diſtinct object. But becauſe this image is ſmall, a concave glaſs *no* is ſo placed in the end of the tube next the eye, that its virtual focus may be at *F*. And as the pencils of rays, paſs converging through the concave glaſs, but converge leſs after paſſing through it than before, they go on further, as to *b* and *a*, before they meet; and the pencils themſelves being made to diverge by paſſing through the concave glaſs, they enter the eye, and form the large picture *ab* upon the retina, whereon it is magnified under the angle *bFa*.

But this teleſcope has one inconveniency which renders it unfit for moſt purpoſes, which is, that the pencils of rays being made to diverge by paſſing through the concave glaſs *no*, very few of them can enter the pupil of the eye; and therefore the field of view is but very ſmall, as is evident by the figure. For none of the pencils which flow either from the top or bottom of the object *AB* can enter the pupil of the eye at *C*, but are all ſtopt by falling upon the iris above and below the pupil: and therefore, only the middle part of the object can be ſeen when the teleſcope lies directly towards it, by means of thoſe rays which proceed from the middle of the object. So that to ſee the whole of it, the teleſcope muſt be moved upwards and downwards, unleſs the object be very remote; and then it is never ſeen diſtinctly.

This inconvenience is remedied by ſubſtituting a convex eye-glaſs, as *gh*, (No. 24.) in place of the concave one; and fixing it ſo in the tube, that its focus may be coincident with the focus of the object-glaſs *cd*, as at *E*. For then, the rays of the pencils flowing from the object *AB*, and paſſing through the object-glaſs *cd*, will meet in its focus, and form the inverted image *mEp*: and as the image is formed in the focus of the eye-glaſs *gh*, the rays of each pencil will be parallel, after paſſing through that glaſs; but the pencils themſelves will croſs in its focus on the other ſide, as at *e*: and the pupil of the eye being in this focus, the image will be viewed through the glaſs, under the angle *geh*; and being at *E*, it will appear magnified, ſo as to fill the whole ſpace *CmepD*.

But, as this teleſcope inverts the image with reſpect to the object, it gives an unpleaſant view of terreſtrial objects; and is only fit for viewing the heavenly bodies, in which we regard not their poſition, becauſe their being inverted does not appear on account of their being round. But whatever way the object ſeems to move, this teleſcope muſt be moved the contrary way, in order to keep ſight of it; for, ſince the object is inverted, its motion will be ſo too.

The magnifying power of this teleſcope is as the focal diſtance of the object-glaſs to the focal diſtance of the eye-glaſs. Therefore, if the former be divided by the latter, the quotient will expreſs the magnifying power.

When we ſpeak of the magnifying of a teleſcope or micro-

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ſcope, it is only meant with regard to the diameter, not to the area nor ſolidity of the object. But as the inſtrument magnifies the vertical diameter, as much as it does the horizontal, it is eaſy to find how much the whole viſible area or ſurface is magnified: for, if the diameters be multiplied into one another, the product will expreſs the magnification of the whole viſible area. Thus, ſuppoſe the focal diſtance of the object-glaſs be ten times as great as the focal diſtance of the eye-glaſs; then, the object will be magnified ten times, both in length and breadth: and 10 multiplied by 10, produces 100; which ſhews, that the area of the object will appear 100 times as big when ſeen through ſuch a teleſcope, as it does to the bare eye.

Hence it appears, that if the focal diſtance of the eye-glaſs were equal to the focal diſtance of the object-glaſs, the magnifying power of the teleſcope would be nothing.

This teleſcope may be made to magnify in any given degree, provided it be of a ſufficient length. For, the greater the focal diſtance of the object-glaſs, the leſs may be the focal diſtance of the eye-glaſs; though not directly in proportion. Thus, an object-glaſs, of 10 feet focal diſtance, will admit of an eye-glaſs whoſe focal diſtance is little more than $2\frac{1}{2}$ inches; which will magnify near 48 times: but an object-glaſs, of 100 feet focus, will require an eye-glaſs ſomewhat more than 6 inches; and will therefore magnify almoſt 200 times.

A teleſcope for viewing terreſtrial objects, ſhould be ſo conſtructed, as to ſhew them in their natural poſture. And this is done by one object-glaſs *cd*, (No. 25.) and three eye-glaſſes *ef*, *gh*, *ik*, ſo placed, that the diſtance between any two, which are neareſt to each other, may be equal to the ſum of their focal diſtances; as in the figure, where the focus of the glaſſes *cd* and *ef* meet at *F*, thoſe of the glaſſes *ef* and *gh* meet at *l*, and of *gh* and *ik* at *n*; the eye being at *n*, in or near the focus of the eye-glaſs *ik*, on the other ſide. Then, it is plain, that theſe pencils of rays, which flow from the object *AB*, and paſs through the object-glaſs *cd*, will meet and form an inverted image *CFD* in the focus of that glaſs; and the image being alſo in the focus of the glaſs *ef*, the rays of the pencils will become parallel, after paſſing through that glaſs, and croſs at *l*, in the focus of the glaſs *ef*; from whence they paſs on to the next glaſs *gh*, and by going through it they are converged to points in its other focus, where they form an erect image *EmF* of the object *AB*: and as this image is alſo in the focus of the eye-glaſs *ik*, and the eye on the oppoſite ſide of the ſame glaſs; the image is viewed through the eye-glaſs in this teleſcope, in the ſame manner as through the eye-glaſs in the former one; only in a contrary poſition, that is, in the ſame poſition with the object.

The three glaſſes next the eye have all their focal diſtances equal: and the magnifying power of this teleſcope is found the ſame way as that of the laſt above; *viz.* by dividing the focal diſtance of the object-glaſs *cd*, by the focal diſtance of the eye-glaſs *ik*, or *gh*, or *cf*, ſince all theſe three are equal.

When the rays of light are ſeparated by refraction, they become coloured; and if they be united again, they will be a perfect white. But thoſe rays which paſs through a convex glaſs near its edges are more unequally refracted than thoſe which are nearer the middle of the glaſs. And when the rays of any pencil are unequally refracted by the glaſs, they do not all meet again in one and the ſame point, but in ſeparate points; which makes the image indiſtinct, and coloured, about its edges. The remedy is, to have a plate with a ſmall round hole in its middle, fixed in the tube at *m*, parallel to the glaſſes. For, the wandering rays about the edges of the glaſſes will be ſtopt, by the plate, from coming to the eye; and none admitted but thoſe which come through the middle of the glaſs, or at leaſt at a good diſtance from its edges, and paſs through the hole in the middle of the plate. But this circumſcribes the image, and leſſens the field of view, which would be much larger if the plate could be diſpenſed with.

The great inconvenience attending the management of long teleſcopes of this kind, has brought them much into diſuſe ever ſince the reflecting teleſcope was invented. For one of this ſort, ſix feet in length, magnifies as much as one of the other an hundred. It was invented by Sir *Iſaac Newton*, but has received conſiderable improvements ſince his time; and is now generally conſtructed in the following manner, which was firſt propoſed by Dr. *Gregory*.

At the bottom of the great tube *TTTT*, (No. 26.) is placed the large concave mirrour *DUVF*, whoſe principal focus is at *m*; and in its middle is a round hole *P*, oppoſite to which is placed the ſmall mirrour *L*, concave toward the great one; and ſo fixed to a ſtrong wire *M*, that it may be moved farther from the great mirrour, or nearer to it, by means of a long ſcrew on the outſide of the tube, keeping its axis ſtill in the ſame line *Pmn* with that of the great one.—Now, ſince in viewing a very remote object, we can ſcarce ſee a point of it but what is at leaſt as broad as the great mirrour, we may conſider the rays of each pencil, which flow from every point of the object, to be parallel to each other, and to cover the whole reflecting ſurface *DUVF*. But to avoid confuſion in the figure, we ſhall only draw two rays of a pencil flowing from each extremity of the object into the great tube, and trace their progreſs, through all their reflections and refractions, to the eye *f*, at the end of the ſmall tube *tt*, which is joined to the great one.

Let us then ſuppoſe the object *AB* to be at ſuch a diſtance, that the rays *B* may flow from its lower extremity *B*, and the rays *E* from its upper extremity *A*. Then the rays *C* falling parallel upon the great mirrour at *D*, will be thence reflected converging, in the direction *DG*; and by croſſing at *I* in the principal focus of the mirrour, they will form the upper extremity *I* of the inverted image *IK*, ſimilar to the lower extremity *B* of the object *AB*: and paſſing on to the concave mirrour *L* (whoſe focus is at *n*) they will fall upon it at *g*, and be thence reflected converging, in the direction *gN*, becauſe *gm* is longer than *gn*; and paſſing through the hole *P* in the large mirrour, they would meet ſomewhere about *r*, and form the lower extremity *B* of the erect image *AB*, ſimilar to the lower extremity *B* of the object *AB*. But by paſſing through the plano-convex glaſs *R* in their way, they form that extremity of the image at *b*. In like manner, the rays *E*, which come from the top of the object *AB*,

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AB, and fall parallel upon the great mirrour at *F*, are thence reflected converging to its focus, where they form the lower extremity *K* of the inverted image *IK*, ſimilar to the upper extremity *A* of the object *AB*; and thence paſſing on to the ſmall mirrour *L*, and falling upon it at *b*, they are thence reflected in the converging ſtate *bO*; and going on through the hole *P* of the great mirrour, they would meet ſomewhere about *q*, and form there the upper extremity *a* of the erect image *ab*, ſimilar to the upper extremity *A* of the object *AB*: but by paſſing through the convex glaſs *R* in their way, they meet and croſs ſooner, as at *a*, where that point of the erect image is formed.—The like being underſtood of all thoſe rays which flow from the intermediate points of the object between *A* and *B*, and enter the tube *TT*; all the intermediate points of the image between *a* and *b* will be formed; and the rays paſſing on from the image, through the eye-glaſs *S*, and through a ſmall hole *e* in the end of the leſſer tube *tt*, they enter the eye *f*, (which ſees the image *ab* by means of the eye-glaſs) under the large angle *ced*, and magnified in length under that angle from *c* to *d*.

In the beſt reflecting teleſcopes, the focus of the ſmall mirrour is never coincident with the focus *n* of the great one, where the firſt image *IK* is formed, but a little beyond it (with reſpect to the eye) as at *n*: the conſequence of which is, that the rays of the pencils will not be parallel after reflection from the ſmall mirrour, but converge ſo as to meet in points about *q*,*e*,*r*; where they would form a larger upright image than *ab*, if the glaſs *R* was not in their way; and this image might be viewed by means of a ſingle eye-glaſs properly placed between the image and the eye; but then the field of view would be leſs, and conſequently not ſo pleaſant; for which reaſon, the glaſs *R* is ſtill retained, to enlarge the ſcope or area of the field.

To find the magnifying power of this teleſcope, multiply the focal diſtance of the great mirrour by the diſtance of the ſmall mirrour from the image next the eye, and multiply the focal diſtance of the ſmall mirrour by the focal diſtance of the eye-glaſs; then, divide the product of the former multiplication by the product of the latter, and the quotient will expreſs the magnifying power.

We ſhall here ſet down the dimenſions of one of Mr. *Short*'s reflecting teleſcopes, as deſcribed in Dr. *Smith*'s optics.

The focal diſtance of the great mirrour 9.6 inches, its breadth 2.3; the focal diſtance of the ſmall mirrour 1.5, its breadth 0.6; the breadth of the hole in the great mirrour 0.5; the diſtance between the ſmall mirrour and the next eye-glaſs 14.2; the diſtance between the two eye-glaſſes 2.4; the focal diſtance of the eye-glaſs next the metals 3.8; and the focal diſtance of the eye-glaſs next the eye 1.1.

One great advantage of the reflecting teleſcope is, that it will admit of an eye-glaſs of a much ſhorter focal diſtance than a refracting teleſcope will; and, conſequently, it will magnify ſo much the more: for the rays are not coloured by reflection from a concave mirrour, if it be ground to a true figure, as they are by paſſing through a convex glaſs, let it be ground ever ſo true.

The adjuſting ſcrew on the outſide of the great tube fits this teleſcopes to all ſorts of eyes, by bringing the ſmall mirrour either nearer to the eye, or removing it farther; by which means, the rays are made to diverge a little for ſhort-ſighted eyes, or to converge for thoſe of a long ſight.

The nearer an object is to the teleſcope, the more its pencils of rays will diverge before they fall upon the great mirrour, and therefore they will be the longer of meeting in points after reflection; ſo that the firſt image *IK* will be formed at a greater diſtance from the large mirrour, when the object is near the teleſcope, than when it is very remote. But as this image muſt be formed farther from the ſmall mirrour than its principal focus *n*, this mirrour muſt be always ſet at a greater diſtance from the large one, in viewing near objects, than in viewing remote ones. And this is done by turning the ſcrew on the outſide of the tube, until the ſmall mirrour be ſo adjuſted, that the object (or rather its image) appears perfect.

In looking through any teleſcope towards an object, we never ſee the object itſelf, but only that image of it which is formed next the eye in the teleſcope. For if a man holds his finger or a ſtick between his bare eye and an object, it will hide part (if not the whole) of the object from his view. But if he ties a ſtick acroſs the mouth of a teleſcope before the object-glaſs, it will hide no part of the imaginary object he ſaw through the teleſcope before, unleſs it covers the whole mouth of the tube: for, all the effect will be, to make the object appear dimmer, becauſe it intercepts part of the rays. Whereas, if he puts only a piece of wire acroſs the inſide of the tub, between the eye-glaſs and his eye, it will hide part of the object which he thinks he ſees: which proves, that he ſees not the real object, but its image. This is alſo confirmed by means of the ſmall mirrour *L*, in the reflecting teleſcope, which is made of opake metal, and ſtands directly between the eye and the object towards which the teleſcope is turned; and will hide the whole object from the eye at *e*, if the two glaſſes *R* and *S* are taken out of the tube.

Of the MULTIPLYING GLASS.

THE multiplying glaſs is made by grinding down the round ſide *bik* (No. 27.) of a convex glaſs *AB*, into ſeveral flat ſurfaces, as *bb*, *bld*, *dk*. An object *C* will not appear magnified when ſeen through this glaſs by the eye at *H*; but it will appear multiplied into as many different objects as the glaſs contains plane ſurfaces. For, ſince rays will flow from the object *C* to all parts of the glaſs, and each plane ſurface will refract theſe rays to the eye, the ſame object will appear to the eye in the direction of the rays which enter it through each ſurface. Thus, a ray *giH*, falling perpendicularly on the middle ſurface, will go through the glaſs to the eye without ſuffering any refraction; and will therefore ſhew the object in its true place at *C*: whilſt a ray *ab* flowing from the ſame object, and falling obliquely on the plane ſurface *bb*, will be refracted in the direction *be*, by paſſing thro' the glaſs; and upon leaving it, will go on to the eye in the direction *eH*; which will cauſe the ſame object *C* to appear alſo at *E*, in the direction of the ray *He*, produced in the right line *Hen*. And the ray *cd*, flowing from the

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the object *C*, and falling obliquely on the plane surface *dk*, will be refracted (by paſſing through the glaſs and leaving it at *f*) to the eye at *H*; which will cauſe the ſame object to appear at *D*, in the direction *Hfm*.—If the glaſs be turned round the line *glH*, as an axis, the object *C* will keep its place, becauſe the ſurface *bld* is not removed; but all the other objects will ſeem to go round *C*, becauſe the oblique planes, on which the rays *ab ed* fall, will go round by the turning of the glaſs.

Of the Camera Obscura.

The *camera obſcura* is made by a convex-glaſs *CD*, (No. 28.) placed in a hole of a window-ſhutter. Then, if the room be darkened ſo as no light can enter but what comes through the glaſs, the pictures of all the objects (as fields, trees, buildings, men, cattle, &c.) on the outſide, will be ſhewn in an inverted order, on a white paper placed at *GH* in the focus of the glaſs; and will afford a moſt beautiful and perfect piece of perſpective or landſcape of whatever is before the glaſs, eſpecially if the ſun ſhines upon the objects.

If the convex glaſs *CD* be placed in a tube in the ſide of a ſquare box, within which is the plane mirrour *EF*, reclining backwards in an angle of 45 degrees from the perpendicular *kq*, the pencils of rays flowing from the outward objects, and paſſing through the convex glaſs to the plane mirrour, will be reflected upwards from it, and meet in points, as *I* and *K* (at the ſame diſtance that they would have met at *H* and *G*, if the mirrour had not been in the way,) and will form the aforeſaid images on an oiled paper ſtretched horizontally in the direction *IK*; on which paper, the out-lines of the images may be eaſily drawn with a black-lead pencil; and then copied on a clean ſheet, and coloured by art, as the objects themſelves are by nature.—In this machine, it is uſual to place a plane glaſs, unpoliſhed, in the horizontal ſituation *IK*, which glaſs receives the images of the outward objects; and their outlines may be traced upon it by a black-lead pencil.

N. B. The tube in which the convex glaſs *CD* is fixed, muſt be made to draw out, or puſh in, ſo as to adjuſt the diſtance of that glaſs from the plane mirrour, in proportion to the diſtance of the outward objects; which the operator does, until he ſees their images diſtinctly pointed on the horizontal glaſs at *IK*.

The forming a horizontal image, as *IK*, of an upright object *AB*, depends upon the angles of incidence of the rays upon the plane mirrour *EF*, being equal to their angles of reflection from it. For, if a perpendicular be ſuppoſed to be drawn to the ſurface of the plane mirrour at *e*, where the ray *AaCe* falls upon it, that ray will be reflected upwards in an equal angle with the other ſide of the perpendicular, in the line *edI*. Again, if a perpendicular be drawn to the mirrour from the point *f*, where the ray *Abf* falls upon it, that ray will be reflected in an equal angle from the other ſide of the perpendicular, in the line *fhI*. And if a perpendicular be drawn from the point *g*, where the ray *Acg* falls upon the mirrour, that ray will be reflected in an equal angle from the other ſide of the perpendicular, in the line *giI*. So that all the rays of the pencil *abc*, flowing from the upper extremity of the object *AB*, and paſſing through the convex glaſs *CD*, to the plane mirrour *EF*, will be reflected from the mirrour, and meet at *I*, where they will form the extremity *I* of the image *IK*, ſimilar to the extremity *A* of the object *AB*. The like is to be underſtood of the pencil *qrs*, flowing from the lower extremity of the object *AB*, and meeting at *K* (after reflection from the plane mirrour) the rays form the extremity *K* of the image, ſimilar to the extremity *B* of the object: and ſo of all the pencils that flow from the intermediate points of the object to the mirrour, through the convex glaſs.

Of the Opera-Glass.

If a convex glaſs, of a ſhort focal diſtance, be placed near the plane mirrour in the end of a ſhort tube, and a convex glaſs be placed in a hole in the ſide of the tube, ſo as the image may be formed between the laſt mentioned convex glaſs and the plane mirrour; the image being viewed through this glaſs, will appear magnified.—In this manner, the *opera-glaſſes* are conſtructed; with which a gentleman may look at any lady at a diſtance in the company, and the lady know nothing of it.

Of the Common Looking-Glass.

The image of any object that is placed before a plane mirrour appears as big to the eye as the object itſelf; and is erect, diſtinct, and ſeemingly as far behind the mirrour, as the object is before it: and that part of the mirrour, which reflects the image of the object to the eye (the eye being ſuppoſed equally diſtant from the glaſs with the object) is juſt half as long and half as broad as the object itſelf. Let *AB* (No. 29.) be an object placed before the reflecting ſurface *ghi* of the plain mirrour *CD*; and let the eye be at *o*. Let *Ah* be a ray of light flowing from the top *A* of the object and falling upon the mirrour at *h*, and *hm* be a perpendicular to the ſurface of the mirrour at *h*; the ray *Ah* will be reflected from the mirrour to the eye at *o*, making an angle *mho* equal to the angle *Ahm*: then will the top of the image *E* appear to the eye in the direction of the reflected ray *oh* produced to *E*, where the right line *ApE*, from the top of the object, cuts the right line *ohE*, at *E*. Let *Bi* be a ray of light proceeding from the foot of the object at *B* to the mirrour at *i*; and *ni* a perpendicular to the mirrour from the point *i*, where the ray *Bi* falls upon it: this ray will be reflected in the line *io*, making an angle *nio*, equal the angle *Bin*, with that perpendicular, and entering the eye at *o*; then will the foot *F* of the image appear in the direction of the reflected ray *oi*, produced to *F*, where the right line *BF* cuts the reflected ray produced to *F*. All the other rays that flow from the intermediate points of the object *AB*, and fall upon the mirrour between *h* and *i*, will be reflected to the eye at *o*; and all the intermediate points of the image *EF* will appear to the eye in the direction of theſe reflected rays produced. But all the rays that flow from the object, and fall upon the mirrour above *h*, will be reflected back above the eye at *o*; and all the rays that flow from the object, and fall upon the mirrour below *i*, will be reflected back below the

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the eye at *o*: ſo that none of the rays that fall above *h*, or below *i*, can be reflected to the eye at *o*; and the diſtance between *h* and *i* is equal to half the length of the object *AB*.

Hence it appears, that if a man ſees his whole image in a plane looking-glaſs, the part of the glaſs that reflects his image muſt be juſt half as long and half as broad as himſelf, let him ſtand at any diſtance from it whatever; and that his image muſt appear juſt as far behind the glaſs as he is before it. Thus, the man *AB* (No. 30.) viewing himſelf in the plane mirrour *CD*, which is juſt half as long as himſelf, ſees his whole image as at *EF*, behind the glaſs, exactly equal to his own ſize. For, a ray *AC*, proceeding from his eye at *A*, and falling perpendicularly upon the ſurface of the glaſs at *C*, is reflected back to his eye, in the ſame line *CA*; and the eye of his image will appear at *E*, in the ſame line produced to *E*, beyond the glaſs. And a ray *BD*, flowing from his foot, and falling obliquely on the glaſs at *D*, will be reflected as obliquely on the other ſide of the perpendicular *abD*, in the direction *DA*; and the foot of his image will appear at *F*, in the direction of the reflected ray *AD*, produced to *F*, where it is cut by the right line *BGF*, drawn parallel to the right line *ACE*. Juſt the ſame as if the glaſs were taken away, and a real man ſtood at *F*, equal in ſize to the man ſtanding at *B*: for to his eye at *A*, the eye of the other man at *E* would be ſeen in the direction of the line *ACE*; and the foot of the man at *F* would be ſeen by the eye *A*, in the direction of the line *ADF*.

If the glaſs be brought nearer the man *AB*, as ſuppoſe to *cb*, he will ſee his image as at *CDG*: for the reflected ray *CA* (being perpendicular to the glaſs) will ſhew the eye of the image as at *C*; and the incident ray *Bb*, being reflected in the line *bA*, will ſhew the foot of his image as at *G*; the angle of reflection *abA* being always equal to the angle of incidence *Bba*: and ſo of all the intermediate rays from *A* to *B*. Hence, if the man *AB* advances towards the glaſs *CD*, his image will approach towards it; and if he recedes from the glaſs, his image will alſo recede from it.

Of the MAGIC LANTERN.

ABCD (No. 31.) is a tin lantern, with a tube *nklm* fixed in the ſide of it. This tube conſiſts of two joints, one of which ſlips into the other: and by drawing this joint out, or puſhing it in, the tube may be made longer or ſhorter. At *kl* in the end of the moveable joint of the tube a convex lens is fixed, and an object painted with tranſparent colours upon a piece of thin glaſs is placed at *de* ſomewhere in the immoveable joint of the tube; ſo that as the tube is lengthened or ſhortened, the lens will be either at a greater or a leſs diſtance from this tranſparent object. In the ſide of the lantern there is a very convex lens *bhc*, which ſerves to caſt a very ſtrong light from the candle within the lantern upon the object *de*. Now when the rays, which ſhine through the object *de*, diverge from the ſeveral points as *d*, *e*, &c. in the object, and fall upon the lens *kl*, they will be made to converge to as many points *f*, *g*, &c. on the other ſide of the lens, and will paint an inverted picture of the object at *fg* upon a white wall, a ſheet or a ſcreen of white paper, provided the object is farther from the lens than its principal focus. To make this picture appear diſtinct and bright, it muſt have no other light fall upon it but what comes through the lens *kl*; and for this reaſon the whole apparatus is to be placed in a dark room EFGH. The lens *kl* muſt be very convex, ſo that the object *de* may be very near to it, and yet not be nearer than its principal focus: for by this means, as the object is near to the lens, the picture *fg* will be at a great diſtance from it, and conſequently the picture will be much bigger than the object. Since the picture is inverted in reſpect of the object, in order to make the picture appear with the right end upwards, it is neceſſary that the object *de* ſhould be placed with the wrong end upwards.

Of the DIFFERENT REFRANGIBILITY *of* LIGHT.

WE have hitherto ſuppoſed that a particle of light, as it comes from the ſun, is the leaſt particle into which light can be ſeparated. But we muſt now correct this ſuppoſition, by ſhewing, that a particle of light, as it comes from the ſun, is, properly ſpeaking, a bundle of rays, which may be ſeparated from one another. Therefore, for the future, by a ray of light we muſt be underſtood to mean, not that collection of particles which we have hitherto called by this name, but the leaſt particles into which light can be ſeparated.

Rays of light are ſaid to be differently refrangible, when at the ſame or equal angles of incidence ſome are more turned out of the way than others.

Rays are ſaid to be differently reflexible, if ſome are more eaſily reflected than others.

Light is called homogeneous, when all the rays are equally refrangible: it is called heterogenous, when ſome rays are more refrangible than others.

The colours of homogeneous light are called primary or ſimple colours; and thoſe of heterogeneous light are called ſecondary or mixed.

The rays of the ſun are not all equally refrangible: and thoſe rays, which have a different degree of refrangibility, have likewiſe a different colour.

If a beam of light SF, (No. 32.) that comes from the ſun, paſſes into a dark room through F a round hole in a window ſhutter EG; this beam proceeding ſtraight forwards, and falling upon a paper at Y, would there make a round picture of the ſun. This picture would be a confuſed one indeed, if the hole is a large one and there is no lens in the hole. However, as this round ſpot of light is a picture of the ſun, we ſhall hereafter, notwithſtanding its confuſion, call it by this name. Now if a glaſs priſm ABC is placed between the hole in the window-ſhutter and the paper at Y, the rays of this beam, by the refraction which they ſuffer in the priſm, will be bent from their ſtrait courſe, and inſtead of going on ſo as to fall upon the paper at Y, they will be turned upwards, and the picture of the ſun produced by them will fall upon a paper MN that is placed above Y. If all the rays

were equally bent upwards, the picture would be a round one upon the paper MN, after the rays have been refracted, as well as when they paſſed ſtraight forwards and fell upon a paper at Y. But this refracted picture PT is found to be oblong. The horizontal diameter or breadth of this oblong picture is equal to the diameter of the circular one Y: but the perpendicular diameter or height of the picture PT is much greater than its breadth. The refraction is made upwards, and not in a horizontal direction: therefore no alteration ought to be made in the breadth or horizontal diameter of the picture; becauſe no refraction, that is not in the direction of that diameter, can make the picture either broader or narrower. And if all the rays were equally refracted upwards, ſuch a refraction would not change the length of the picture; as it is round when it falls at Y, ſo it would be round when it is refracted upwards by the priſm and falls at PT. This oblong picture conſiſts therefore of rays, which are differently refrangible: they all fall at equal angles of obliquity upon BC the firſt ſide of the priſm, but in the refraction ſome are more turned out of the way than others: thoſe rays which go to P, the upper part of the picture, are the moſt refrangible; and thoſe which go to T, the lower part of it, are leaſt refrangible: the reſt, which fall between P and T, have intermediate degrees of refrangibility.

This oblong picture is of different colours in different parts of it. The moſt refrangible rays at P are violet, the leaſt refrangible at T are red; the rays of intermediate refrangibility from the violet downwards to the red are indigo-coloured, blue, green, yellow, and orange. So that the whole picture is made up of rays of theſe ſeven different colours. We may from hence ſee the reaſon why the coloured picture conſiſting of differently refrangible rays ſhould be oblong, in ſuch a manner that the two ſides of it are right lines, and the two ends ſemicircles. For it conſiſts (as in No. 33.) of ſeven circles, the higheſt of which PAGQ is violet, the loweſt STN is red, the five intermediate ones, BH, CI, DK, EL, OM, are indigo coloured, blue, green, yellow, and orange. The white round picture Y, (No. 32.) is formed by heterogeneous rays, that are of ſeven different ſorts, diſtinguiſhed from one another by their different degrees of refrangibility and different colours. The refraction of the priſm ſeparates theſe rays from one another by refracting ſome of them more and others leſs. And conſequently the refracted picture will conſiſt of ſeven round pictures one below another. Theſe round pictures are ſo near to each other, that the higheſt of them APGR will mix itſelf with ſome of thoſe below it, as with BH and CQI. This nearneſs of theſe ſeveral round pictures to each other will prevent their colours from being diſtinctly ſeen; it will likewiſe make the ſides AS, GN, which are compoſed of ſmall arcs of circles very cloſe to one another, appear like right lines; but the two ends P and T will be ſemicircles.

If the centres of theſe circles continue at the ſame diſtance from one another, and the circles themſelves are made leſs, as *apg*, *bh*, *ci*, *dk*, *el*, *om*, *stn*, they will then be diſtinct or will not mix with each other; and as the colours of the ſeveral parts will by this means be kept ſeparate, ſo the refracted rays, inſtead of forming one continued oblong picture, will form ſeven ſmall circular ones placed in a line perpendicular to the horizon. This ſeparation of the ſeveral parts in the refracted picture from each other is brought about, (as in No. 34.) by making the hole F in the window-ſhutter very ſmall, and by collecting the rays that come through it with a convex lens MN. For this will make a very ſmall white picture of the ſun at L, if there is no priſm *abc*: but the refraction of this priſm, if it is placed a little beyond the lens, will ſeparate the heterogeneous rays by refracting them upwards; and inſtead of one ſmall round and white picture at L, there will be ſeven ſmall round pictures at PT, of which *r* will be violet, *s* indigo, *u* blue, *x* green *l* yellow, *y* orange, and *z* red.

That the priſm ABC (No. 32.) does not make the rays diverge, ſo as to ſpread over the ſpace PT, upon any other account but their different refrangibility, will be evident, if (as in No. 35.) a ſecond priſm DH is placed beyond the firſt *abc*. For if the rays that come from S and paſs through the hole F of the window-ſhutter EG, were by the firſt priſm *abc* made to diverge and form the oblong picture PT upon any other account beſides their different refrangibility; then, ſuppoſing a ſecond priſm DH to be placed at right angles to the former, the effect muſt be this; the firſt priſm *abc* makes the rays diverge from one another in a line PT perpendicular to the horizon, and conſequently the ſecond priſm DH muſt make them diverge from one another in a line parallel to the horizon; ſo that the ſecond priſm would increaſe the breadth of the picture, as much as the firſt increaſed its length; and as one priſm alone makes the picture a long one, both of them together would make it ſquare, as *prst*. But this ſecond refraction does not alter the figure of the picture, but only the poſition of it: the ſecond priſm refracts the picture ſideways; and thoſe rays, which fell the higheſt at P after the firſt refraction, are refracted ſideways the moſt by the ſecond priſm; thoſe which fell the loweſt at T are refracted ſideways the leaſt; by which means the picture, though it continues oblong, will not be perpendicular to the horizon as PT was, but will be inclined ſo as to lie in the poſition *pt*. This makes it evident, that the ſpreading of the rays by the firſt refraction was owing to their different refrangibility, and to no other cauſe. It muſt be owing to their different refrangibility, becauſe thoſe which were moſt refracted upwards by the firſt priſm are moſt refracted ſideways by the ſecond. It cannot be owing to any other cauſe, becauſe if it was, the ſecond priſm would ſpread the rays in breadth as much as the firſt priſm ſpreads them in length, and both priſms would make the picture ſquare.

Thoſe rays of light, which are moſt refrangible, are likewiſe moſt reflexible.

When a beam of light is admitted into a dark chamber through the hole F in the window-ſhutter EG, (No. 36.) and this beam falls upon a priſm ACB, the ſides of which AC and AB are equal, and the angle at A a right one; when the obliquity of theſe rays, as they are to paſs out of the priſm at its baſe BC, is leſs than 40 degrees, the greateſt part of the beam will paſs out, but ſome few rays will

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will be reflected at the ſurface BC. The rays, which paſs through the baſe, form an oblong coloured picture HK, where MH is a more refrangible ray, and MK a leſs refrangible one. If the few rays of the beam, which are reflected from M in the direction MN, are made to paſs through another priſm XYV, they will likewiſe form an oblong coloured picture *pt*, where *p* is the moſt refrangible and *t* the leaſt refrangible ray. This picture will be a very faint one, becauſe there are but few rays reflected from M.

Now if the priſm ACB is turned ſlowly round upon its axis in the direction ACB, the obliquity of the rays EM to the baſe BC will keep increaſing, till at laſt this obliquity may become ſo great, that no rays will paſs out at M, but all of them will be reflected. When this total reflection is made, the oblong picture *pt*, which was faint before, will become much brighter, becauſe then not only a few rays, but all the beam, will be reflected thither. This total reflection will not be made all at once; but as the priſm is turned ſlowly round upon its axis, the moſt refrangible rays MH will be firſt reflected, for the violet colour will diſappear in the oblong picture HK, whilſt all the other colours continue as bright as they were before; and when this colour diſappears at HK, the ſame colour at *p* will become bright, and all the other colours at *pt* will continue as faint as they were before. When the priſm is turned a little farther upon its axis, the indigo colour, which conſiſts of rays that have the next greateſt degree of refrangibility, will be reflected, ſo that this colour will diſappear at HK and will become bright at *pt*. The ſame thing will happen to all the rays in their order; as the priſm is turned round, each different ſort of rays will be reflected ſooner as the rays have a greater degree of refrangibility, or latter as they have a leſs degree. The red rays at K, which are the leaſt refrangible of all, will be reflected laſt of all. From hence therefore it appears, that the rays of the ſun are differently reflexible, and that thoſe which are moſt refrangible are likewiſe moſt reflexible.

Homogeneous light is refracted regularly without any dilatation or ſcattering of the rays.

When the rays of any one particular colour in the oblong picture of the ſun, as the green rays, for inſtance, are ſeparated from one another; if ſome of theſe green rays which are homogeneal, or are all equally refrangible, are tranſmitted through a very ſmall round hole in a ſtiff paſteboard, and are refracted by a priſm on the other ſide of the hole, the picture formed by theſe green rays after refraction upon a white paper held beyond the priſm will not be oblong, but circular, as the hole is through which they paſſed. Therefore this homogeneous light is not dilated, nor are the rays of it ſcattered by this refraction.

The confuſed appearance of objects, when they are ſeen through refracting bodies, is owing to the different refrangibility of light.

If flies, or the letters of a ſmall print, or any other minute objects, are placed in heterogeneal light, ſuch as a direct beam of the ſun's, which has never been ſeparated by any refraction into its homogeneous parts; theſe objects being viewed through a glaſs-priſm will be ſeen confuſedly, their edges will appear ſo miſty that the ſmaller parts of minute animals cannot eaſily be diſtinguiſhed from one another, and the letters of the ſmall print cannot be read. But if the ſame objects are placed in a beam of homogeneous light, which is ſeparated from all other rays of a different refrangibility in the manner already deſcribed, they will appear as diſtinct through a priſm as if they were viewed with the naked eye. Therefore we may conclude, that this confuſion is owing to the different refrangibility of thoſe rays which come from the objects; ſince objects never appear confuſed when they are ſeen through refracting bodies, unleſs they are enlightened with ſeveral ſorts of rays which have different degrees of refrangibility.

It is probable that any ſingle ray of the leaſt refrangible ſort contains a greater quantity of matter than any ſingle ray of the moſt refrangible ſort.

We have already ſeen, that at the ſame angles of incidence violet rays will be more refracted or more turned out of the way than red rays. And we have likewiſe ſeen, that rays are refracted when they paſs out of one medium into another, by being either more or leſs attracted in one medium than they are in the other. Now ſince, when all other circumſtances are equal, when red rays and violet rays fall at equal obliquities, and are to paſs out of glaſs into air, ſo that the mediums, and conſequently the attractive force or cauſe of refraction, is given; if the ſame cauſe can turn the violet rays more out of the way, or refract them more, than it does the red rays, theſe rays muſt have different moments; the moſt refrangible rays, or thoſe which are moſt eaſily turned out of the way, have the leaſt moment; and the leaſt refrangible rays, or thoſe which are moſt difficult to turn out of the way, have the greateſt moment. But if all ſorts of rays have the ſame velocity, their reſpective quantities of matter will be as their moments; and conſequently any ſingle ray of the moſt refrangible ſort contains a leſs quantity of matter than any ſingle ray of the leaſt refrangible ſort.

It may be upon this account that a red colour, or a pale purple, is leſs pleaſant to the eye than a blue, green, or a yellow. The red rays ſtrike the eye with ſo great a force as to be offenſive to it; and the ſmall force of the pale purple ones will produce too faint a ſenſation to be agreeable. The intermediate colours are therefore more pleaſant to the eye, as the force of the rays is neither too great to be offenſive, nor too ſmall to produce a quick and lively ſenſation.

The colours of homogeneous light are ſo invariable, that neither any refraction nor any reflection can alter them.

If a beam of homogeneous light paſſes through a round hole in a paſteboard, and then is refracted by a priſm on the other ſide of the hole, this refraction will make no alteration in the colour of the rays; if they were red, or whatever was their colour, before they entered the priſm, their colour will ſtill be the ſame, when they have paſſed through it, and fall upon a white paper held beyond the priſm. This proves the firſt part of the propoſition, that the

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the colours of homogeneous light are to be changed by any refraction.

Red lead, when it is viewed in open day-light, or when heterogeneous rays fall upon it, will likewiſe be red, if it is placed in homogeneous red light: but red lead, when it is placed in any other ſort of homogeneous light, will have the ſame colour with the rays that fall upon it and are reflected from it: if it is placed in yellow homogeneous light, it will be yellow; if in green light, it will be green; or if in blue light, it will be blue. Conſequently the reflection of the rays from the red lead make no alteration in their colour; for if it did, rays of any ſort reflected from the lead would be of the ſame colour, ſo that it would appear red in whatever ſort of light it was placed. The ſame that is here ſaid of red lead, is true of any other ſubſtance of any other colour. Graſs, which is green either in open day-light or in homogeneous green light, will not change the colour of any homogeneous rays by reflecting them, but will itſelf have the ſame colour with the rays in which it is placed; it will be red in red light, or blue in blue light, or yellow in yellow light.

From hence we may conclude, by the way, that a body is of any particular colour, not becauſe it reflects no other rays but thoſe of that particular colour, but becauſe it reflects thoſe more copiouſly and others more ſparingly. Red lead, as it appears red in red light, ſo in green light it appears green, or in blue light it appears blue: conſequently it reflects rays of theſe ſorts, and in the ſame manner it might be ſhewn to reflect all other ſorts of rays. But then the red colour of red lead, when it is placed in red light, is much brighter than any other colour will be that it puts on by being placed in another ſort of light: conſequently it reflects red rays more copiouſly than any other ſort of rays; and for this reaſon, when it is placed in open day-light, where it reflects all ſorts of rays at once, the red rays are ſo much more numerous than the reſt, as to make the whole mixture of their own colour.

Colours may be produced by compoſition, which ſhall in appearance be like the colour of homogeneous light: but then theſe compound colours will be altered by refraction.

When, by means of two holes in the window-ſhutter of a dark room and of two priſms, two oblong coloured pictures are produced; if a circular piece of white paper is ſo placed that the red light of one picture and the yellow light of the other may fall upon it, this mixture will produce an orange colour, that in appearance will be like the primary orange colour. But between the ſimple and compound colour, though they are alike in appearance, there will be this difference; if the circular piece of paper, when it is enlightened with compound orange, is viewed through a priſm, the rays will be found to be differently refrangible, and they will, by the refraction of the priſm, be ſo ſeparated from one another, that the paper ſeen through it will appear as two circles, one of which will be red and the other yellow; whereas, if the ſame paper, when it is enlightened with ſimple or primary orange, is viewed in like manner through a priſm, the rays will be found to be equally refrangible, and the paper will appear through the priſm, as it does to the naked eye, to be one orange-coloured circle diſtinctly terminated all round. After the ſame manner other homogeneous colours, as blue and yellow, when mixed together, will produce a a new compound colour like the intermediate homogeneous green colour in appearance. But then the rays of this compound green will not be all of them equally refrangible, as the rays of the ſimple or primary green colour are.

The whiteneſs of the ſun's light is compounded of all the primary colours mixed in a due proportion.

Let the oblong coloured picture (No. 37.) fall upon the convex lens MN; and then all the rays which are ſeparated from one another at PT will be collected together by paſſing through the lens, and will meet at its focus G, in ſuch a manner as to form a round picture of the ſun upon a white paper DE. This round picture, which conſiſts of rays of all ſorts, of red, orange, yellow, blue, green, indigo, and violet, is white. And this whiteneſs is compounded of all the primary colours mixed together. None of the rays change their colour by being mixed with the reſt; each ſort retains the ſame colour after it is mixed with the reſt that it had before; neither the red rays, nor the orange, nor the yellow, nor the blue, nor the green, nor the indigo, nor the violet, are made white by being mixed with the reſt at the focus; but though none of the parts are white, yet the whole mixture is white.

That the whiteneſs at the focus G ariſes from a mixture of all the primary colours, is evident. For if any of the colours are intercepted at the lens, the focus loſes its whiteneſs, and becomes of that colour which ariſes from a mixture of thoſe which are not intercepted. Thus if all the rays at PT are intercepted except the yellow, the orange, and the red, the focus will not be white, but will be orange-coloured. If all the rays are intercepted at PT, except the blue, the green, and the yellow, the focus will then be green. The orange in one caſe, and the green in the other caſe, is the compound colour ariſing from a mixture of thoſe rays which are not intercepted. And in either caſe, if the rays that were intercepted are again ſuffered to paſs through the lens, the focus will recover its whiteneſs.

It may be more difficult to ſhew that the rays, when they are all of them mixed at the focus, retain their proper colours, and are none of them white though the compound mixture is white. To make this out, let the paper be removed from DE, where all the rays are mixed upon it at G, to *de*, where it will receive the rays, after they have croſſed one another at the focus, and having got beyond it diverge again. In this poſition of the the paper, becauſe the rays that were mixed at the focus have diverged from thence, and are again ſeparated from one another, the oblong coloured picture will appear again at *tp*, ſo that the red colour T, which was the loweſt at the lens, will be the higheſt at the paper *de*. But though the colours are thus inverted by paſſing the focus, yet all of them appear at *tp*; which would have been impoſſible, if each ſort of rays, by being mixed with the reſt at the focus, had loſt their colour, and had been made white. Nor indeed is the colour of any ſort of rays at all changed by being mixed with the reſt at the focus; but the

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the ſame rays that produced any particular colour in the oblong picture PT are the rays that produce the ſame colour in the inverted picture *tp*; as would be evident from intercepting any particular colour at PT: for if the green rays, for inſtance, are intercepted at PT, there will be no green at *tp*: or if the red are intercepted at PT, there will then appear no red colour at *tp*: and the ſame thing will happen upon intercepting the rays of any other colour at PT, for then that colour will vaniſh at *tp*.

Colours may be produced by compoſition that are neither exactly like any of the primary ones, nor fully white.

If the red rays of one coloured picture are mixed with the violet rays of another, according to the various proportions in which they are mixed, various purples will be produced, ſuch as are not like in appearance to the colour of any homogeneous light; and of theſe purples, mixed with yellow and blue, may be made other new colours.

By mixing the coloured powders which painters uſe, though the powders themſelves reſemble the primary colours, yet the mixture may be grey, or dun, or ruſſet-brown, ſuch as are the colours of a man's nail, of a mouſe, of aſhes, of ordinary ſtones, of mortar, of duſt and dirt in the high-ways. Thus one part of red lead, and five of viride æris, compoſe a dun colour like that of a mouſe. If to orpiment, which is yellow, a full bright purple powder uſed by painters is added, the mixture may be made of a pale red; and with the addition of a little viride æris, which, as the name imports, is green, and of a little blue biſe, this pale red will change to grey or pale white, ſuch as is the colour of aſhes, or of wood newly cut, or of a man's ſkin.

Theſe grey, dun, and ruſſet colours are only imperfect ſorts of white. And we may underſtand, why the mixture of theſe coloured powders ſhould produce an imperfect white, and not a full bright one, from the following obſervation. All coloured powders ſuppreſs and ſtop great part of the light that falls upon them: they reflect more of thoſe rays from whence their colour ariſes than of any other ſort; but they reflect even thoſe more ſparingly than white bodies do. Red lead, for inſtance, reflects fewer red rays than white paper does; for if red lead and white paper are both of them placed in homogeneous red light, the paper will appear of a brighter red than the lead. But if red lead ſuppreſſes many red rays, it may well be ſuppoſed to ſuppreſs many more rays of other colours; ſince its redneſs is owing to its reflecting red rays more copiouſly, and all other rays more ſparingly. From hence it follows, that in a mixture of coloured powders, though they reflect rays of all ſorts in a due proportion, ſo that the compound light will not be more of one colour than another, but will be white; yet the whiteneſs will be much leſs bright than that of paper; becauſe the mixture of powders ſuppreſſes and ſtops many rays, whereas the paper reflects almoſt all the rays that fall upon it, and ſuppreſſes ſcarce any. Thus the whiteneſs in the mixture of powders, and the whiteneſs in the paper, are both of the ſame ſort, and differ from one another only in degree, or in the quantity of light. Therefore, if ſome of this mixture of powders is placed in bright ſunſhine, and a piece of white paper is placed in the ſhade, the mixture by thus increaſing the light, and the paper by thus diminiſhing it, may be made to appear equally white.

The colours of all bodies are either the ſimple colours of homogeneous light, or ſuch compound colours as ariſe from a mixture of homogeneous light.

Each ſort of light has a peculiar colour of its own, which no refraction or reflection can change. Therefore the colour of no natural body can be any other than either the colour of ſome ſort of homogeneous light, or a compound colour ariſing from a mixture of the ſeveral ſorts. For bodies appear coloured only by reflecting light; and no reflection can give any other colours to the rays but what they had before.

Of the Colours *of* thin transparent Plates.

Water, air, glaſs, or any other tranſparent ſubſtance, when drawn out into thin plates, become coloured.

Water, when it is made tenacious by having ſoap mixed with it, may be blown up into a bubble A, (No. 38.) ſuch as children play with. If this bubble is ſet under a glaſs, ſo that the motion of the air may not affect it, then as the water glides down the ſides of it, and the top of it at A grows thinner, ſeveral colours will ſucceſſively appear at A, and will ſpread themſelves from thence in rings ſurrounding A, and deſcending farther and farther down the ſides of the bubble, till they vaniſh at BC in the ſame order in which they appeared. Thus, for inſtance, the firſt colour that appears at A, the top of the bubble, is red: this red ſpot ſpreads itſelf into a circular ring round A, and then the top of the bubble A becomes blue: this blue ſpot ſpreads itſelf in the ſame manner round A, and then A becomes red a ſecond time. Before we go on to conſider what other colours ariſe at A, we will obſerve what becomes of thoſe which ariſe firſt. The red, which firſt appeared at A, ſpreads itſelf into a circular ring round A: this ring grows larger, as the water glides down the ſides of the bubble; ſo that the coloured ring glides down the bubble along with the water, till it ſinks at laſt to BC, and there encompaſſes the bubble. In like manner the blue, which ariſes at A after the red, ſpreads itſelf and deſcends down the bubble, as the red ring did. The colour which ariſes next at A, is red a ſecond time; this ſpreads itſelf in the ſame manner, and is ſucceeded by blue a ſecond time. Theſe are followed by a great variety of colours, which appear ſucceſſively at A, and ſpread themſelves from thence in this order: Red, yellow, green, blue, purple; then again red, yellow, green, blue, violet; and laſtly, red, yellow, white, blue. This laſt blue colour is ſucceeded at A by a black ſpot, which reflects ſcarce any light: this ſpot dilates itſelf, but not into a circular ring as the colours had done; it becomes broader and broader, till the bubble breaks.

A thin plate of water of the ſame ſort with this bubble, but more laſting, may be otherwiſe procured. If a piece of plane poliſhed glaſs is placed upon the object-glaſs of a long teleſcope, as in (No. 39.) the plane ſurface of one glaſs, and the convex one of the other, will touch one another only at a ſingle point; and if the interval between them is filled with water, as the glaſſes are preſſed together, the ſame colours ariſe at the point of

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contact, and ſpread themſelves in circular rings round it in the ſame order as in the ſoap-bubble. If BC (No. 40) is a ſection of the plane glaſs, and DAE a ſection of the convex one; when they are preſſed cloſe together, the thin plate of water that fills the interval between them will have a black ſpot at A; and this ſpot will be encompaſſed with rings of colours, in the ſame order that they ſtand in that figure upon the line BC, on each ſide of A. If the colours are reckoned in the order in which they ſtand on the plate of water after the black ſpot appears at A, and we reckon them from the ſpot A towards the edges of the plate at B and C; then we muſt call blue the firſt colour. But if we reckon them in the order in which they aroſe at A, and ſpread themſelves; then we muſt begin from B or C, the edges of the plate, and go on towards A, and in this reckoning we muſt call red the firſt colour.

If there is no water between the two glaſſes, then the interval will be filled with air, and this thin plate of air will have the ſame colours that the plate of water had; with this difference only, that each of the coloured rings is larger in the plate of air than in the plate of water.

When glaſs is blown very thin at a lamp-furnace, thin plates of it thus formed will exhibit colours; and ſo likewiſe will thin plates of Muſcovy-glaſs. Metals, when they are heated, ſend out to their ſurfaces ſcoria or vitrified parts, which cover the metals in form of a thin ſkin; and theſe ſcoria or thin plates cauſe colours upon the ſurface of the metal, ſuch as are made to appear on poliſhed ſteel by heating it, or on bell-metal by melting it firſt and then pouring it on the ground to cool in the air.

When the thin plate is denſer than the medium that ſurrounds it, the colours are more vivid than they are when the plate is rarer than that medium.

A thin bubble is a plate of water encompaſſed with air; where the ſubſtance of the plate, which is water, is denſer than the air, which is the medium that ſurrounds it. On the contrary, the plate of air between the two glaſſes BAC, DAE, (No. 40.) is encompaſſed with glaſs; and here the ſubſtance of the plate is rarer than that of the circumambient medium; and the colours on the bubble of water are more vivid than thoſe on the thin plate of air.

When thin tranſparent plates reflect one ſort of rays, they tranſmit the reſt.

If the plate of air between the two glaſſes BAC, DAE, (No. 40.) is viewed by reflected light, the colours of it are thoſe expreſſed on the upper part of the figure from B to C; but if we look through it, that is, if we view it by tranſmitted light, or if the tranſmitted light falls upon a white paper, the colours that we ſee through the plate, or that fall on the paper, are thoſe expreſſed on the lower part of the figure. Now, any of the tranſmitted colours are what would ariſe from a mixture of all the remaining rays, after thoſe of the reflected colour are ſeparated from the ſun's heterogeneal light. Thus, for inſtance, the fourth reflected colour from the black ſpot A inclufively is yellow, the tranſmitted colour is violet. The yellow rays, and ſome of the orange and green, are reflected here, ſo that the mixture of the reflected light will be yellow. The mixture of the tranſmitted light therefore will be violet, or rather ſuch a purple as is not exactly like any of the primary colours; for we obſerved, that from red rays, violet, and blue, new purples may be produced.

This is the caſe in ſome natural bodies, as well as in theſe tranſparent artificial plates; for if leaf-gold, which is made thin enough to tranſmit light, is held againſt the ſtrong light of the ſun's rays, the gold, which is yellow when ſeen by the reflected light, will be blue when thus ſeen by tranſmitted light.

The ſeventh reflected colour inclufively from the black ſpot is blue, the ſeventh tranſmitted colour is yellow. When the rays which make the blue colour are taken out of the ſun's heterogeneous light, the remaining rays will be yellow. Thus it happens likewiſe in ſome natural bodies; for an infuſion of lignum nephriticum, which is blue when ſeen by reflected light, is yellow when ſeen by tranſmitted light.

The black ſpot A reflects ſcarce any light: and as rays of all colours are tranſmitted there, the tranſmitted colour is white; the third reflected colour from the black ſpot inclufively is white. Therefore, ſince all the rays are reflected there, no colour ought to be ſeen there, when we look through the plate; and accordingly that part of the plate is black.

Hence we ſee the reaſon why, if there be two liquors of full colours in two different glaſs veſſels, ſuppoſe red and blue; though each is tranſparent when we look thro' it ſeparately, yet we ſhould not be able to ſee through both of them together if one was held behind the other. For if the blue liquor, for inſtance, is held towards the light, and the red towards the eye; ſince only blue rays paſs through the firſt liquor, and come to the ſecond; and ſince the ſecond liquor will tranſmit no blue rays, but only red ones; it follows, that no rays at all can come to the eye.

Indeed ſome tranſparent bodies appear of the ſame colour, whether we ſee them by reflected or tranſmitted light. Of this ſort is moſt painted glaſs. But when this is the caſe, the coloured rays are reflected from the ſecond ſurface of the body. Thus, if a piece of painted glaſs is yellow either when ſeen by reflected light or when ſeen by tranſmitted light, all the rays but the yellow ones are ſuppreſſed as they paſs through the glaſs: of the yellow rays, moſt are tranſmitted at the ſecond ſurface; the few which are reflected from thence will be ſufficient to tinge all the light yellow, which is reflected from the firſt ſurface. This will be evident from making the body thick, and pitching it on the backſide: for by this means the reflected colour will be loſt; whereas, if it had been reflected from the firſt ſurface, the pitch at the ſecond ſurface could not have altered it.

The more denſe the ſubſtance is out of which a thin plate is made, the leſs is the thickneſs of the plate where it reflects any certain colour.

The colours are the ſame whether there is air or water between the two glaſſes BAC, DAE, (No. 40) only the coloured circles are ſmaller in the plate of water than in the plate of air. Thus the yellow, for inſtance, which is the fourth coloured circle from the black ſpot, is a leſs circle, or is nearer to the black ſpot, when there is a plate of water between the glaſſes, than when there is a

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plate of air between them. But as the diſtance from the point of contact A, the cloſer the glaſſes are to one another, and conſequently the thinner will be the plate that lies between them; conſequently that part of a plate of water where this yellow appears, is thinner than that part of a plate of water where the ſame colour appears. And the ſame holds good in any other colour. But water is more denſe than air: therefore, the more denſe the ſubſtance is out of which a thin plate is made, the leſs is the thickneſs of the plate where it reflects any certain colour.

The ſort of colour, which is reflected from any part of a thin plate, depends only upon the thickneſs of the plate itſelf in that part: but the ſame colour will be made leſs vivid by increaſing the denſity of the medium with which the plate is encompaſſed.

The colours upon any part of a thin plate of Muſcovy glaſs are the ſame in ſort, whether the plate is dry or wetted with water. Therefore the ſort of colour in any part depends not upon the medium that encompaſſes the plate, but upon the thickneſs of the plate itſelf; ſince the colours are the ſame when the plate is dry and encompaſſed with air, or wet and ſo encompaſſed with water. But the ſame colours are more faint when the plate is wet, than when it is dry; and conſequently, the brightneſs of the colours does depend upon the medium that encompaſſes the plate; and the denſer that medium is, the fainter will be the colours; they are are more faint when the plate is covered with water than when it is dry and ſo is ſurrounded with air.

The rays of light have alternate fits of eaſy reflection and eaſy tranſmiſſion, which return at equal intervals.

Let GF, (No. 41.) be a beam of homogeneous light conſiſting all of one ſort of rays, as ſuppoſe all the rays that compoſe the beam were red ones. Then, if theſe rays fall upon a thin plate of air between the two glaſſes BAC, DAE, at A there will be a dark ſpot, and all the rays will be tranſmitted: round this ſpot there will be a red ring, where all the rays are reflected; round this red ring there will be a dark ring, where all the rays are tranſmitted. And if the thickneſs of of the plate where all the rays are reflected in the ring neareſt to A is called 1, the thickneſs where the dark ring appears and all the rays are tranſmitted will be 2. Again, at that part of the plate where the thickneſs is 3, all the rays will be tranſmitted: at the thickneſs 4, they will be all reflected. And thus alternately, as expreſſed by the lines in the figure, the rays will be reflected in all parts of the plate where the thickneſs is expreſſed by any of the uneven numbers 1, 3, 5, 7, 9, *&c.* and will be tranſmitted where the thickneſs is expreſſed by any of the even numbers 2, 4, 6, 8, 10, *&c.*

Now as the plate is the ſame in all parts, the cauſe of this alternate reflection and tranſmiſſion muſt be in the rays themſelves; and their diſpoſitions to be thus alternately reflected and tranſmitted, are what we call fits of eaſy reflection and eaſy tranſmiſſion.

The rays that are in a fit of eaſy reflection penetrate as far as the ſecond ſurface of the plate. For if the ſecond ſurface of a thin plate of Muſcovy glaſs is wetted, the colours cauſed by the alternate reflection grow fainter; whereas if the reflection was made at the firſt ſurface, wetting the ſecond could not affect the colours. But ſince thoſe rays which have paſſed from the firſt ſurface of the plate to the ſecond where the thickneſs of it is 1, are reflected, and thoſe which have paſſed from the firſt ſurface to the ſecond where the thickneſs of it is 2, are tranſmitted; and then again thoſe which have thus paſſed from one ſurface to the other, where the thickneſs is 3, are reflected; and thoſe which have paſſed in the ſame manner, where the thickneſs is 4, are tranſmitted; it follows, that the fits of eaſy reflection and tranſmiſſion return at equal intervals. So that, if a ray was to ſet out from A in the line AB, (No. 42.) and was to be in a fit of eaſy reflection when it had moved from A to *c*, it would be in a fit of eaſy tranſmiſſion when it had moved to twice that diſtance from A, or when it was got to *d*: at *e*, or the diſtance 3 from A, it will be in a fit of eaſy reflection; at *f*, or the diſtance 4, in a fit of eaſy tranſmiſſion; at *g*, or 5, in a fit of eaſy reflection; at B, or 6, in a fit of eaſy tranſmiſſion: and thus, in the farther progreſs of the ray, the ſame fits will return at equal intervals.

Thus if the thickneſs of the plate of air, where the rays of any homogeneous colour are all reflected, is equal to *Ac* or 1, and the rays are in a fit of eaſy reflection when they come to the ſecond ſurface of the plate; then, where the thickneſs of the plate is *Ad* or 2, the rays will be in a fit of eaſy tranſmiſſion when they come to the ſecond ſurface, and conſequently will all paſs through that ſurface. Again, where the thickneſs is *Ae* or 3, the rays, when they come to the ſecond ſurface, will be in a fit of eaſy reflection, and will all be reflected; where the thickneſs is *Af* or 4, the fit of eaſy tranſmiſſion will be returned when the rays come to the ſecond ſurface, ſo that all of them will be tranſmitted. And in like manner, by ſuch fits returning at equal intervals, the rays will be reflected where the thickneſs is expreſſed by the number 1, 3, 5, 7, 9, *&c.* and will be tranſmitted where it is expreſſed by 2, 4, 6, 8, 10, *&c.*

When a thin coloured plate is viewed obliquely, the colours of every part in the plate will be altered.

When a bubble of water or a plate of air between two glaſſes BAC, DAE, (No. 40.) is viewed obliquely, the coloured rings dilate themſelves: and conſequently a ring of any one colour, by being dilated, gets into that part of the plate where a ring of ſome other colour appeared when the plate was viewed directly.

If the plate is denſer than the medium that encompaſſes it, the colours of it, when viewed obliquely, change leſs than they would if the plate was rarer than the medium that encompaſſes it.

A bubble of water is a thin plate denſer than the air that encompaſſes it: and a plate of air between the two glaſſes BAC, DAE, (No. 48.) is rarer than the glaſs that encompaſſes it. Upon viewing each of theſe thin plates obliquely, the coloured rings on the plate of water dilate leſs than thoſe on the plate of air. Therefore, ſince it is by this dilation of the rings that a ring of one

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one colour gets into a part of the plate where a ring of ſome other colour appeared when the plate was viewed directly; that is, ſince it it by this dilatation of the rings that the ſeveral parts of the plates change their colours; it follows, that any part of a plate of water encompaſſed with air changes colour leſs upon being viewed obliquely, than any part of a plate of air encompaſſed with glaſs.

When the medium which encompaſſes a coloured tranſparent plate is given, the colours change leſs upon altering the ſituation of the eye, as the ſubſtance is more denſe out of which that plate is made.

The matter out of which a bubble of water is made is not ſo denſe as that out of which a bubble of glaſs is made, and glaſs is not ſo denſe as the ſcoria or glaſſy ſkin thrown out by metals when they are heated. Now, any of theſe plates either of water, or glaſs, or metalline ſubſtance, when they are encompaſſed with the ſame medium air, will change their colour a little upon being viewed obliquely; but the plate of water changes the moſt, the plate of glaſs leſs than that, and the ſcoria of metals leaſt of all.

Of the OPAKENESS, TRANSPARENCY, *and* COLOURS *of* NATURAL BODIES.

The opakeneſs of bodies is owing to the many reflections and refractions which the rays of light ſuffer within thoſe bodies.

THE ſmalleſt parts of almoſt all natural bodies are tranſparent, as will readily be granted by thoſe who have been uſed to look through microſcopes. A piece of leaf-gold is tranſparent if it is held up againſt the hole of a window-ſhutter in a dark room; and any other ſubſtance, however opake it may ſeem in the open air, will appear tranſparent by the ſame means, when it is made of a ſufficient thinneſs. Even metals become tranſparent, if they are diſſolved in a proper menſtruum, as gold in aqua regia, or ſilver in aqua fortis; and by being thus diſſolved, are reduced to very ſmall particles. But ſince even in opake bodies every ſingle particle tranſmits light, or is tranſparent, the whole would likewiſe tranſmit light, unleſs the rays, when they are to paſs through all the particles which make up the whole, were ſo turned out of the way by innumerable refractions and reflections, as to be ſtopped and ſuppreſſed in their paſſage. That this is the reaſon why bodies that conſiſt of tranſparent particles ſhould be opake, is evident; ſince opake bodies, when they are reduced to a ſufficient thinneſs, become tranſparent: for then there will be but few particles lying beyond one another for the light to paſs through; and as the rays will ſuffer fewer refractions and reflections, ſome of them may get through a thin plate, though all of them would be ſuppreſſed in a thicker maſs of the ſame ſubſtance.

The medium, with which the pores of opake bodies are filled, is not of the ſame denſity with the particles of thoſe bodies.

BODIES conſiſt of tranſparent particles, and their opakeneſs is owing to the many reflections and refractions which the light ſuffers within them. Now, if the interſtices between the particles of any body were filled with a medium of the ſame denſity with the particles, the light would neither be refracted nor reflected as it paſſed out of the particles into the interſtices and out of the interſtices into the pores, but would paſs through the body, and the body would be tranſparent. Conſequently, in an opake body, where the light is ſuppreſſed by the refractions and reflections which it ſuffers, the particles that compoſe the body, and the medium that fills the pores or interſtices between the particles, muſt be of different denſities.

Hence we may ſee the reaſon why paper, when it has been dipped in water or oil, is more tranſparent than when it is dry. For when the paper is thoroughly wetted with water or oil, the pores of it are filled with a medium that is nearly of the ſame denſity with its particles. On the contrary, though oil of turpentine and water are both of them tranſparent when they are ſeparate; yet if they are ſhaken together ſo as to mix but imperfectly, the mixture becomes much leſs tranſparent; becauſe the parts of each fluid are ſeparated from one another, and thoſe of the other fluid, which are of a different denſity, get in between them.

The parts of bodies, and their interſtices, muſt not be leſs than of a certain definite bigneſs to render them opake and coloured.

THE moſt opake bodies become tranſparent when their particles are ſubtilly divided; as metals, ſuch as gold or ſilver, which are opake in large maſſes, become tranſparent when the former is diſſolved in aqua regia, and the latter in aqua fortis. And we obſerved, that at the top of a bubble of water, where the water is extremely thin, there is a black ſpot, which reflects ſcarce any light at all; though the water is encompaſſed with air, which is a medium of a different denſity. Conſequently, if the diameter of the particles of which any natural ſubſtance conſiſts was no greater than the thickneſs of the bubble, where it reflects no light, but tranſmits all, ſuch a body would be tranſparent, notwithſtanding the interſtices that are between its particles were filled with a medium the denſity of which is different from theirs.

In like manner, we obſerved, that when a thin plate of air lies between two pieces of glaſs BAC, DAE, (No 40.) there is a dark ſpot, which reflects no light, and tranſmits all, not only at the point A where the glaſſes touch one another, but alſo round that point to ſome diſtance where the glaſſes are very near to one another. From hence we may conclude, that though the particles of any natural ſubſtance were as denſe as glaſs, and the medium which fills their interſtices was as rare as air; yet if theſe interſtices were no bigger than the interval between the two glaſſes BAC, DAE, at that place where all light is tranſmitted, ſuch a body would be tranſparent.

The tranſparency of water ſeems to be owing to the cauſes here mentioned, to the ſmallneſs of its parts, or of its pores, or of both. For we are ſure that the pores of water are filled with air, becauſe the air may be drawn out from the water in an air-pump; and conſequently, as the pores are filled with a medium of a different denſity from the parts, the mixture ought to be opake, like ſuch a mixture of water and oil of turpentine as was mentioned above, But the ſmallneſs either of the parts,

or

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or of the interſtices, or of both, will prevent the mixture from being opake.

Since therefore all bodies will be tranſparent, if either their parts or their interſtices are too ſmall, it follows that the parts, and likewiſe the pores, of ſuch bodies as are not tranſparent but opake and coloured, muſt not be leſs than of a certain and determinate bigneſs.

The colours of natural bodies depend upon the ſize of their particles.

Different parts of thin tranſparent plates, according to the different thickneſs of them, are of different colours. Now if any part of ſuch a thin plate of glaſs, for inſtance, where it appears of one uniform colour, ſhould be ſplit into threads, or broken into ſmall particles, all theſe particles would make a heap of powder of the ſame colour. And the ſmall particles of natural bodies, ſince they are tranſparent, like ſo many fragments of a thin plate, muſt exhibit colours in the ſame manner.

The parts of bodies, on which their colours depend, are much denſer than the medium which fills their pores.

For where the tranſparent plate or particle conſiſts of a rarer ſubſtance than the medium that encompaſſes it, the colours are leſs vivid than thoſe of natural bodies commonly are. For this reaſon it is that the colours of ſilks or cloths, when they are wetted with oil or water, become more faint; becauſe theſe liquors are more nearly of the ſame denſity with the particles, than the medium is which fills the interſtices when they are dry. Beſides, the colours upon a tranſparent plate change very ſenſibly, unleſs the plate conſiſts of a ſubſtance much denſer than the medium that encompaſſes it; but moſt natural bodies are of the ſame colour in whatever poſition of the eye they are viewed. Therefore their tranſparent particles, upon which their colours depend, are much denſer than the medium which encompaſſes thoſe particles or fills the interſtices between them.

Nor is the caſe otherwiſe even in thoſe bodies which do change colour upon being viewed obliquely, ſuch as changeable ſilks, or the feathers of a peacock's tail or of a pigeon's neck. For this change of colour, upon the ſituation of the eye being changed, is no reaſon for concluding that the medium which fills the interſtices or pores is more nearly of the ſame denſity with the particles, upon which the colours depend, in theſe bodies than in others; ſince the change of colour is plainly owing to our ſeeing a different part of the body in different poſitions of the eye. Thus, in changeable ſilks, the warp is of one colour, and the woof of another; and in one poſition of the eye more of the warp is ſeen, and in another poſition of it more of the woof is ſeen. In like manner, if a pigeon's neck appears blue in one poſition of the eye, and crimſon in another, it is becauſe in theſe different poſitions we ſee different parts of the ſame feathers.

We cannot from the colour of a body make any conjecture about the ſize of the particles upon which its colours depend.

Suppose, from the appearance of the colour in any yellow body, that we had determined its yellow to be of the ſame ſort with that which is next to the black ſpot in a plate of air, or water, or glaſs. The thickneſs of a plate, where it appears of this colour, is different according to the different denſity of the ſubſtance out of which that plate is made; the thickneſs of a plate of air where it appears of this colour, is greater than that of a plate of water were it appears of the ſame colour, and much greater ſtill than that of a plate of glaſs. Suppoſe therefore farther, that we were able to determine exactly what is the thickneſs of a plate of air or water or glaſs, where each of them is tinged with the ſame yellow colour that any natural body exhibits; yet we cannot determine whether the diameter of the particles, upon which this body's colour depends, is equal to the thickneſs of the plate of air, or of water, or of glaſs, unleſs we could firſt determine whether the denſity of thoſe particles is equal to the denſity of air, or to that of water, or to that of glaſs: ſince the particles muſt be larger, if their denſity is equal to the denſity of air, than if it is equal to the denſity of water; and larger, if it is equal to that of water than if it is equal to that of glaſs. And indeed we have good reaſon to conclude, that the denſity of the parts, upon which the colours of natural bodies depend, is greater even than that of glaſs; and conſequently that the diameter of thoſe parts is much leſs than the thickneſs of a plate of glaſs, where it appears of the ſame colour with the body. For, upon being viewed obliquely, thin plates of glaſs change colour, whereas natural bodies do not: and the colour of natural bodies is made more unchangeable than that of thin plates of glaſs, by their particles being more denſe than glaſs.

Of the Rainbow.

When the rays of the ſun fall upon a drop of rain and enter into it, ſome of them, after one reflection and two refractions, may come to the eye of a ſpectator who has his back towards the ſun and his face toward the drop.

If XY, (No. 43.) is a drop of rain, and the ſun ſhines upon it in any lines *if*, *id*, *ia*, &c. moſt of the rays will enter into the drop: ſome few of them only will be reflected from the firſt ſurface; thoſe rays, which are reflected from thence, do not come under our preſent conſideration, becauſe they are never refracted at all. The greateſt part of the rays then enter the drop, and thoſe paſſing on to the ſecond ſurface will moſt of them be tranſmitted through the drop; but neither do thoſe rays which are thus tranſmitted fall under our preſent conſideration, ſince they are not reflected. For the rays, which are deſcribed in the propoſition, are ſuch as are twice refracted and once reflected. However, at the ſecond ſurface, or hinder part of the drop, at *pg* ſome few rays will be reflected, whilſt the rays are tranſmitted: thoſe rays proceed in ſome ſuch lines as *nr*, *nq*; and coming out of the drop in the lines *rv*, *qt*, may fall upon the eye of a ſpectator, who is placed any where in thoſe lines, with his face towards the drop, and conſequently with his back towards the ſun, which is ſuppoſed to ſhine upon the drop in the lines *if*, *id*, *ia*, &c. Theſe rays are twice refracted, and once reflected: they are refracted, when they paſs out of the air into the drop; they are reflected from the ſecond ſurface, and are refracted again, when they paſs out of the drop into the air.

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When rays of light reflected from a drop of rain come to the eye, thoſe are called effectual which are able to excite a ſenſation.

When rays of light come out of a drop of rain, they will not be effectual, unleſs they are parallel and contiguous.

THERE are but few rays that can come to the eye at all: for the greateſt part of thoſe rays which enter the drop *xy* (N° 43.) between *x* and *a*, paſs out of the drop thro' the hinder ſurface *pg*; only few are reflected from thence and come out through the nearer ſurface between *a* and *y*. Now ſuch rays as emerge, or come out of the drop, between *a* and *y*, will be ineffectual, unleſs they are parallel to one another, as *rv* and *qt* are; becauſe ſuch rays as come out diverging from one another, will be ſo far aſunder when they come to the eye, that all of them cannot enter the pupil; and the very few that can enter it will not be ſufficient to excite any ſenſation. But even rays, which are parallel, as *rv*, *qt*, will not be effectual, unleſs there are ſeveral of them contiguous or very near to one another. The two rays *rv* and *qt* alone will not be perceived, though both of them enter the eye; for ſo very few rays are not ſufficient to excite a ſenſation.

When rays of light come out of a drop of rain after one reflection, thoſe will be effectual which are reflected from the ſame point, and which entered the drop near to one another.

ANY rays, as *sb* and *cd*, (No. 44.) when they have paſſed out of the air into a drop of water, will be refracted towards the perpendiculars *bl*, *dl*; and as the ray *sb* falls farther from the axis *av* than the ray *cd*, *sb* will be more refracted than *cd*; ſo that theſe rays, though parallel to one another at their incidence, may deſcribe the lines *be* and *de* after refraction, and be both of them reflected from one and the ſame point *e*. Now all rays which are thus reflected from one and the ſame point, when they have deſcribed the lines *ef*, *eg*, and after reflection emerge at *f* and *g*, will be ſo refracted, when they paſs out of the drop into the air, as to deſcribe the lines *fh*, *gi*, parallel to one another. If theſe rays were to return from *e* in the lines *eb*, *ed*, and were to emerge at *b* and *d*, they would be refracted into the lines of their incidence *bs*, *dc*. But if theſe rays, inſtead of being returned in the lines *eb*, *ed*, are reflected from the ſame point *e* in the lines *eg*, *ef*, the lines of reflection *eg* and *ef* will be inclined both to one another and to the ſurface of the drop: juſt as much as the lines *eb* and *ed* are. Firſt *eb* and *eg* make juſt the ſame angle with the ſurface of the drop: for the angle *bex*, which *eb* makes with the ſurface of the drop, is the complement of incidence: and the angle *gey*, which *eg* makes with the ſurface, is the complement of reflection; and theſe two are equal to one another. In the ſame manner we might prove that *ed* and *ef* make equal angles with the ſurface of the drop. Secondly, the angle *bed* is equal to the angle *feg*, or the reflected rays *eg*, *ef*, and the incident rays *be*, *de*, are equally inclined to each other. For the angle of incidence *bel* is equal to the angle of reflection *gel*, and the angle of incidence *del* is equal to the angle of reflection *fel*; conſequently the difference between the angles of incidence is equal to the difference between the angles of reflection, or *bel—del=gel—fel*, or *bed=gef*. Since therefore either the lines *eg* *ef*, or the lines *eb* *ed*, are equally inclined both to one another and to the ſurface of the drop; the rays will be refracted in the ſame manner, whether they were to return in the lines *eb*, *ed*, or are reflected in the lines *eg*, *ef*. But if they were to return in the lines *eb*, *ed*, the refraction, when they emerge at *b* and *d*, would make them parallel. Therefore, if they are reflected from one and the ſame point *e* in the lines *eg*, *ef*, the refraction, when they emerge at *g* and *f*, will likewiſe make them parallel.

But though ſuch rays, as are reflected from the ſame point in the hinder part of a drop of rain, are parallel to one another, when they emerge, and ſo have one condition that is requiſite towards making them effectual; yet there is another condition neceſſary; for rays, that are effectual, muſt be contiguous, as well as parallel. And though rays, which enter the drop in different places, may be parallel when they emerge, thoſe only will be contiguous which enter it nearly at the ſame place.

Let *xy*, (No. 43.) be a drop of rain, *ag* the axis or diameter of the drop, and *sa* a ray of light that comes from the ſun and enters the drop at the point *a*. This ray *sa*, becauſe it is perpendicular to both the ſurfaces, will paſs ſtrait through the drop in the line *agh* without being refracted; but any collateral rays that fall about *sb*, as they paſs through the drop, will be made to converge to their axis, and paſſing out at *n* will meet the axis at *b*: rays which fall farther from the axis than *sb*, ſuch as thoſe which fall about *sc*, will likewiſe be made to converge; but then their focus will be nearer to the drop than *b*. Suppoſe therefore *i* to be the focus to which the rays that fall about *sc* will converge, any ray *sc*, when it has deſcribed the line *co* within the drop, and is tending to the focus *i*, will paſs out of the drop at the point *o*. The rays that fall upon the drop about *sd*, more remote ſtill from the axis, will converge to a focus ſtill nearer than *i*, as ſuppoſe at *k*. Theſe rays therefore go out of the drop at *p*. The rays, that fall ſtill more remote from the axis, as *se*, will converge to a focus nearer than *k*, as ſuppoſe at *l*; and the ray *se*, when it has deſcribed the line *eo* within the drop, and is tending to *l*, will paſs out at the point *o*. The rays, that fall ſtill more remote from the axis, will converge to a focus ſtill nearer. Thus the ray *sf* will after refraction converge to a focus at *m*, which is nearer than *l*; and having deſcribed the line *fn* within the drop, it will paſs out at the point *n*. Now here we may obſerve, that as any rays *sb* or *sc*, fall farther above the axis *sa*, the points *n*, or *o*, where they paſs out behind the drop, will be farther above *g*; or that, as the incident ray riſes from the axis *sa*, the arc *gno* increaſes, till we come to ſome ray *sd*, which paſſes out of the drop at *p*; and this is the higheſt point where any ray that falls upon the quadrant or quarter *ax* can paſs out: for any rays *se*, or *sf*, that fall higher than *sd*, will not paſs out in any point above *p*, but at the points *o*, or *n*, which are below it. Conſequently, though the arc *gnop* increaſes, whilſt the diſtance of the incident ray from the axis *sa* increaſed, till we come to the ray *sd*; yet afterwards, the higher the

ray

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ray falls above the axis *sa*, this arc *pong* will decreaſe.

We have hitherto ſpoken of the points on the hinder part of the drop, where the rays paſs out of it; but this was for the ſake of determining the points from whence thoſe rays are reflected, which do not paſs out behind the drop. For, in explaining the rain-bow, we have no farther reaſon to conſider thoſe rays which go through the drop; ſince they can never come to the eye of a ſpectator placed any where in the lines *rv* or *qt* with his face towards the drop. Now, as there are many rays which paſs out of the drop between *g* and *p*, ſo ſome few rays will be reflected from thence; and conſequently the ſeveral points between *g* and *p*, which are the points where ſome of the rays paſs out of the drop, are likewiſe the points of reflection for the reſt which do not paſs out. Therefore, in reſpect of thoſe rays which are reflected, we may call *gp* the arc of reflection; and may ſay, that this arc of reflection increaſes, as the diſtance of the incident ray from the axis *sa* increaſes, till we come to the ray *sd*; the arc of reflection is *gn* for the ray *sb*, it is *go* for the ray *sc*, and *gp* for the ray *sd*. But after this, as the diſtance of the incident ray from the axis *sa* increaſes, the arc of reflection decreaſes; for *og* leſs than *pg* is the arc of reflection for the ray *se*, and *ng* is the arc of reflection for the ray *sf*.

From hence it is obvious, that ſome one ray, which falls above *sd*, may be reflected from the ſame point with ſome other ray which falls below *sd*. Thus, for inſtance, the ray *sb* will be reflected from the point *n*, and the ray *sf* will be reflected from the ſame point; and conſequently, when the reflected rays *nr*, *nq*, are refracted as they paſs out of the drop at *r* and *q*, they will be parallel, by what has been ſhewn in the former part of this propoſition. But ſince the intermediate rays, which enter the drop between *sf* and *sb*, are not reflected from the ſame point *n*, theſe two rays alone will be parallel to one another when they come out of the drop, and the intermediate rays will not be parallel to them. And conſequently theſe rays *rv*, *qt*, though they are parallel after they emerge at *r* and *q*, will not be contiguous, and for that reaſon will not be effectual; the ray *sd* is reflected from *p*, which has been ſhewn to be the limit of the arc of reflection; ſuch rays, as fall juſt above *sd*, and juſt below *sd*, will be reflected from nearly the ſame point *p*, as appears from what has been already ſhewn. Theſe rays therefore will be parallel, becauſe they are reflected from the ſame point *p*; and they will likewiſe be contiguous, becauſe they all of them enter the drop at one and the ſame place very near to *d*. Conſequently, ſuch rays as enter the drop at *d*, and are reflected from *p* the limit of the arc of reflection, will be effectual; ſince, when they emerge at the fore part of the drop between *x* and *y*, they will be both parallel and contiguous.

If we can make out hereafter that the rain bow is produced by the rays of the ſun which are thus reflected from drops of rain as they fall whilſt the ſun ſhines upon them, this propoſition may ſerve to ſhew us, that this appearance is not produced by any rays that fall upon any part and are reflected from any part of thoſe drops: ſince this appearance cannot be produced by any rays but thoſe which are effectual; and effectual rays muſt always enter each drop at one certain place in the fore-part of it, and muſt likewiſe be reflected from one certain place in the hinder ſurface.

When rays that are effectual emerge from a drop of rain after one reflection and two refractions, thoſe which are moſt refrangible will, at their emerſion, make a leſs angle with the incident rays than thoſe do which are leaſt refrangible; and by this means the rays of different colours will be ſeparated from one another.

Let *fh* and *gi*, (No. 44.) be effectual violet rays emerging from the drop at *fg*; and *fn*, *gp*, effectual red rays emerging from the ſame drop at the ſame place. Now, though all the violet rays are parallel to one another, becauſe they are ſuppoſed effectual; and though all the red rays are likewiſe parallel to one another for the ſame reaſon; yet the violet rays will not be parallel to the red rays. Theſe rays, as they have different colours, and different degrees of refrangibility, will diverge from one another; any violent ray *gi*, which emerges at *g*, will diverge from any red ray *gp*, which emerges at the ſame place. Now, both the violet ray *gi*, and the red ray *gp*, as they paſs out of the drop of water into the air, will be refracted from the perpendicular *lo*. But the violet ray is more refrangible than the red one, and for that reaſon *gi*, or the refracted violet ray, will make a greater angle with the perpendicular than *gp* the refracted red ray; or the angle *igo* will be greater than the angle *pgo*. Suppoſe the incident ray *sb* to be continued in the direction *sk*, and the violet ray *ig* to be continued backward in the direction *ik*, till it meets the incident ray at *k*. Suppoſe likewiſe the red ray *pg* to be continued backwards in the ſame manner, till it meets the incident ray at *w*. The angle *ikk* is that which the violet ray, or moſt refrangible ray at its emerſion, makes with the incident ray; and the angle *pws* is that which the red ray, or leaſt refrangible ray at its emerſion, makes with the incident ray. The angle *iks* is leſs than the angle *pws*. For, in the triangle *gwk*, *gws* or *pws* is the external angle at the baſe, and *gkw* or *iks* is one of the internal oppoſite angles; and either internal oppoſite angle is leſs than the external angle at the baſe. Euc. b. I. prop. 16. What has been ſhewn to be true of the rays *gi* and *gp* might be ſhewn in the ſame manner of the rays *fh* and *fn*, or of any other rays that emerge reſpectively parallel to *gi* and *gp*. But all the effectual violet rays are parall to *gi*, and all the effectual red rays are parallel to *gp*. Therefore the effectual violet rays at their emerſion make a leſs angle with the incident ones than the effectual red ones. And for the ſame reaſon, in all the other ſorts of rays, thoſe which are moſt refrangible, at their emerſion from a drop of rain after one reflection, will make a leſs angle with the incident rays, than thoſe do which are leſs refrangible.

Or otherwiſe: When the rays *gi* and *gp* emerge at the ſame point *g*, as they both come out of water into air, and conſequently are refracted from a perpendicular, inſtead of going ſtraight forwards in the line *eg* continued, they will both be turned round upon the point *g* from the perpendicular *go*. Now it is eaſy to conceive, that either of theſe lines might be turned in this manner upon the point

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g as upon a centre, till they became parallel to *sb* the incident ray. But if either of theſe lines or rays were refracted ſo much from *go* as to become parallel to *sb*, the ray ſo much refracted would, after emerſion, make no angle with *sk*, becauſe it would be parallel to it. And conſequently that ray which is moſt turned round upon the point *g*, or that ray which is moſt refrangible, will after emerſion be neareſt parallel to the incident ray, or will make the leaſt angle with it. The ſame may be proved of all other rays emerging parallel to *gi* and *gp* reſpectively, or of all effectual rays; thoſe, which are moſt refrangible, will after emerſion make a leſs angle with the incident rays, than thoſe do which are leaſt refrangible.

But ſince the effectual rays of different colours make different angles with *sk* at their emerſion, they will be ſeparated from one another: ſo that if the eye was placed in the beam *fghi*, it would receive only rays of one colour from the drop *xagy*; and if it was placed in the beam *fgnp*, it would receive only rays of ſome other colour.

The angle *swp*, which the leaſt refrangible or red rays make with the incident ones, when they emerge ſo as to be effectual, is found by calculation to be 42 degrees 2 minutes. And the angle *ski*, which the moſt refrangible rays make with the incident ones, when they emerge ſo as to be effectual, is found to be 40 degrees 17 minutes. The rays, which have the intermediate degrees of refrangibility, make with the incident ones intermediate angles between 42 degrees 2 minutes and 40 degrees 17 minutes.

If a line is ſuppoſed to be drawn from the centre of the ſun through the eye of the ſpectator, the angle which any effectual ray, after two refractions and one reflection, makes with the incident ray, will be equal to the angle which it makes with that line.

Let the eye of the ſpectator be at *i*, (No. 44.) and let *qt* be the line ſuppoſed to be drawn from the centre of the ſun through the eye of the ſpectator; the angle *git*, which any effectual ray makes with this line, will be equal to the angle *iks*, which the ſame ray makes with the incident ray *sb* or *sk*. If *sb* is a ray coming from the centre of the ſun, then ſince *qt* is ſuppoſed to be drawn from the ſame point, theſe two lines, upon account of the remoteneſs of the point from whence they are drawn, may be looked upon as parallel to one another. But the right line *ki* croſſing theſe two parallel lines will make the alternate angles equal. Euc. b. I. prop. 29. Therefore *kit* or *git* is equal to *ski*.

When the ſun ſhines upon the drops of rain as they are falling; the rays that come from thoſe drops to the eye of a ſpectator, after one reflection and two refractions, produce the primary rainbow.

If the ſun ſhines upon the rain as it falls, there are commonly ſeen two bows, as AFB, CHD, (No. 46.) or if the cloud and rain does not reach over that whole ſide of the ſky where the bows appear, then only a part of one or of both bows is ſeen in that place where the rain falls. Of theſe two bows, the innermoſt AFB is the more vivid of the two, and this is called the primary bow. The outer part TFY of the primary bow is red, the inner part VEX is violet; the intermediate parts, reckoning from the red to the violet, are orange, yellow, green, blue, and indigo. Suppoſe the ſpectator's eye to be at O, and let LOP be an imaginary line drawn from the centre of the ſun through the eye of the ſpectator: If a beam of light S coming from the ſun falls upon any drop F; and the rays that emerge at F in the line FO, ſo as to be effectual, make an angle FOP of 42 degrees 2 minutes with the line LP; then theſe effectual rays make an angle of 42 degrees 2 minutes with the incident rays, by the preceding propoſition, and conſequently theſe rays will be red, ſo that the drop F will appear red. All the other rays, which emerge at F, and would be effectual if they fell upon the eye, are refracted more than the red ones, and conſequently will paſs above the eye. If a beam of light S falls upon the drop E; and the rays that emerge at *E* in the line EO, ſo as to be effectual, make an angle EOP of 40 degrees 17 minutes with the line LP; then theſe effectual rays make likewiſe an angle of 40 degrees 17 minutes with the incident rays, and the drop E will appear of a violet colour. All the other rays, which emerge at E, and would be effectual if they came to the eye, are refracted leſs than the violet ones, and therefore paſs below the eye. The intermediate drops between F and E will for the ſame reaſons be of the intermediate colours.

Thus we have ſhewn why a ſet of drops from F to E, as they are falling, ſhould appear of the primary colours, red, orange, yellow, green, blue, indigo, and violet. It is not neceſſary that the ſeveral drops, which produce theſe colours, ſhould all of them fall at exactly the ſame diſtance from the eye. The angle FOP, for inſtance, is the ſame whether the diſtance of the drop from the eye is OF, or whether it is in any other part of the line OF ſomething nearer to the eye. And whilſt the angle FOP is the ſame, the angle made by the emerging and incident rays, and conſequently the colour of the drop, will be the ſame. This is equally true of any other drop. So that although in the figure the drops F and E are repreſented as falling perpendicularly one under the other, yet this is not neceſſary in order to produce the bow.

But the coloured line FE, which we have already accounted for, is only the breadth of the bow. It ſtill remains to be ſhewn, why not only the drop F ſhould appear red, but why all the other drops quite from A to B in the arc ATFYB ſhould appear of the ſame colour. Now it is evident, that where-ever a drop of rain is placed, if the angle, which the effectual rays make with the line LP is equal to the angle FOP, that is, if the angle which the effectual rays make with the incident rays is 42 degrees 2 minutes, any of thoſe drops will be red, for the ſame reaſon that the drop F is of this colour.

If FOP was to turn round upon the line OP, ſo that one end of this line ſhould always be at the eye, and the other be at P oppoſite to the ſun; ſuch a motion of this figure would be like that of a pair of compaſſes turning round upon one of the legs OP with the opening FOP. In this revolution the drop F would deſcribe a circle, P would be the centre, and ATFYB would be an arc in this circle. Now ſince, in this motion of the line and drop OF, the angle made by FO with OP, that is, the angle FOP, continues the ſame; if the ſun was to ſhine upon this drop as it revolves, the effectual rays would make the ſame angle

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angle with the incident rays, in whatever part of the arc ATFYB the drop was to be. Therefore, whether the drop is at A, or at T, or at Y, or at B, or where-ever elſe it is in this whole arc, it would appear red, as it does at F. The drops of rain, as they fall, are not indeed turned round in this manner: but then, as innumerable of them are falling at once in right lines from the cloud, whilſt one drop is at F, there will be others at Y, at T, at B, at A, and in every other part of the arc ATFYB: and all theſe drops will be red for the ſame reaſon that the drop F would have been red, if it had been in the ſame place. Therefore, when the ſun ſhines upon the rain as it falls, there will be a red arc ATFYB oppoſite to the ſun. In the ſame manner, becauſe the drop E is violet, we might prove that any other drop, which, whilſt it is falling, is in any part of the arc AVEXB, will be violet, and conſequently, at the ſame time that the red arc ATFYB appears, there will likewiſe be a violet arc AVEXB below or within it. FE is the diſtance between theſe two coloured arcs; and from what has been ſaid it follows, that the intermediate ſpace between theſe two arcs will be filled up with arcs of the intermediate colours, orange, yellow, blue, green, and indigo. All theſe coloured arcs together make up the primary rainbow.

The primary rainbow is never a greater arc than a ſemicircle.

Since the line LOP is drawn from the ſun through the eye of the ſpectator, and ſince P (No. 46.) is the centre of the rainbow; it follows, that the centre of the rainbow is always oppoſite to the ſun. The angle FOP is an angle of 42 degrees 2 minutes, as was obſerved, or F the higheſt part of the bow is 42 degrees 2 minutes from P the centre of it. If the ſun is more than 42 degrees 2 minutes high, P the centre of the rainbow, which is oppoſite to the ſun, will be more than 42 degrees 2 minutes below the horizon; and conſequently F the top of the bow, which is only 42 degrees 2 minutes from P, will be below the horizon; that is, when the ſun is more than 42 degrees 2 minutes high, no primary rainbow will be ſeen. If the ſun is ſomething leſs than 42 degrees 2 minutes high, then P will be ſomething leſs than 42 degrees 2 minutes below the horizon; and conſequently F, which is only 42 degrees 2 minutes from P, will be juſt above the horizon; that is, a ſmall part of the bow at this height of the ſun will appear cloſe to the ground oppoſite to the ſun. If the ſun is 20 degrees high, then P will be 20 degrees below the horizon; and F the top of the bow, being 42 degrees 2 minutes from P, will be 22 degrees 2 minutes above the horizon; therefore, at this height of the ſun, the bow will be an arc of a circle whoſe centre is below the horizon; and conſequently that arc of the circle, which is above the horizon, or the bow, will be leſs than a ſemicircle. If the ſun is in the horizon, then P, the centre of the bow, will be in the oppoſite part of the horizon; F, the top of the bow, will be 42 degrees 2 minutes above the horizon; and the bow itſelf, becauſe the horizon paſſes thro' the centre of it, will be a ſemicircle. More than a ſemicircle can never appear; becauſe if the bow was more than ſemicircle, P the centre of it muſt be above the horizon; but P is always oppoſite to the ſun, therefore P cannot be above the horizon, unleſs the ſun is below it; and when the ſun is ſet, or is below the horizon, it cannot ſhine upon the drops of rain, as they fall; and conſequently, when the ſun is below the horizon, no bow at all can be ſeen.

When the rays of the ſun fall upon a drop of rain, ſome of them, after two reflections and two refractions, may come to the eye of a ſpectator, who has his back towards the ſun and his face towards the drop.

If *hgw*, (No. 45.) is a drop of rain, and parallel rays coming from the ſun, as *zv*, *yw*, fall upon the lower part of it, they will be refracted towards the perpendiculars *vl*, *wl*, as they enter into it, and will deſcribe ſome ſuch lines as *vh*, *wi*. At *h* and *i* great part of theſe rays will paſs out of the drop; but ſome of them will be reflected from thence in the lines *hf*, *ig*. At *f* and *g* again, great part of the rays, that were reflected thither, will paſs out of the drop. But theſe rays will not come to the eye of a ſpectator at *o*. However, here again all the rays will not paſs out; but ſome few will be reflected from *f* and *g*, in ſome ſuch lines as *fd*, *gh*; and theſe, when they emerge out of the drop of water into the air at *b* and *d*, will be refracted from the perpendiculars, and, deſcribing the lines *dt*, *bo*, may come to the eye of a ſpectator who has his back towards the ſun and his face towards the drop.

Thoſe rays, which are parallel to one another after they have been once refracted and once reflected in a drop of rain, will be effectual when they emerge after two refractions and two reflections.

No rays can be effectual, unleſs they are contiguous, and parallel. From what was ſaid, it appears, that when rays come out of a drop of rain contiguous to one another, either after one or after two reflections, they muſt enter the drop nearly at one and the ſame place. And if ſuch rays as are contiguous are parallel after the firſt reflection, they will emerge parallel, and therefore will be effectual. Let *zv* and *yw* be contiguous rays which come from the ſun, and are parallel to one another when they fall upon the lower part of the drop *bgw*, (No. 45.) ſuppoſe theſe rays to be refracted at *v* and *w*, and to be reflected at *h* and *i*; if they are parallel to one another, as *hf*, *gi*, after this firſt reflection, then, after they are reflected a ſecond time from *f* and *g*, and refracted a ſecond time as they emerge at *d* and *b*, they will go out of the drop parallel to one another in the lines *dt* and *bo*, and will therefore be effectual.

The rays *zv*, *yw*, are refracted towards the perpendiculars *vl*, *wl*, when they enter the drop, and will be made to converge. As theſe rays are very oblique, their focus will not be far from the ſurface *vw*. If this focus is at *k*, the rays, after they have paſſed the focus, will diverge from thence in the directions *kh*, *ki*; and if *ki* is the principal focal diſtance of the concave reflecting ſurface *hi*, the reflected rays *hf*, *ig*, will be parallel. Theſe rays *hf*, *ig*, are reflected again from the concave ſurface *fg*, and will meet in a focus at *e*, ſo that *ge* will be the principal focal diſtance of this reflecting ſurface *fg*. And becauſe *hi* and *fg* are parts of the ſame ſphere, the principal focal diſtances *ge* and *ki* will be equal to one another. When the rays have paſſed the focus *e*, they will diverge from thence in the lines *ed*, *eb*: and we are to ſhew, that, when they emerge at *d* and *b*, and are refracted there, they will become parallel.

Now if the rays *vk*, *wk*, when they have met at *k*, were to be turned back again in the directions *kv*, *kw*, and were to emerge at *v* and *w*, they would be refracted into the lines of their incidence *vz*, *wy*, and therefore would be parallel. But ſince *ge* is equal to *ik*, as has already been ſhewn, the

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rays *ed*, *eb*, that diverge from *e*, fall in the ſame manner upon the drop at *d* and *b*, as the rays *kv*, *kw*, would fall upon it at *v* and *w*; and *ed*, *eb*, are juſt as muſt inclined to the refracting ſurface *db*, as *kv*, *kw*, would be to the ſurface *vw*. From hence it follows, that the rays *ed*, *eb*, emerging at *d* and *b*, will be refracted in the ſame manner, and will have the ſame direction in reſpect of one another, as *kv*, *kw*, would have. But *kv* and *kw* would be parallel after refraction. Therefore *ed* and *eb* will emerge in lines *dp*, *bo*, ſo as to be parallel to one another, and conſequently ſo as to be effectual.

When rays that are effectual emerge from a drop of rain after two reflections and two refractions, thoſe which are moſt refrangible will at their emerſion make a greater angle with the incident rays than theſe do which are leaſt refrangible; and by this means the rays of diſſerent colours will be ſeparated from one another.

If rays of different colours, which are differently refrangible, emerge at any point *b*, (No. 45.) theſe rays will not be all of them equally refracted from the perpendicular. Thus, if *bo* is a red ray, which is of all others the leaſt refrangible, and *bm* is a violet ray, which is of all others the moſt refrangible; when theſe two rays emerge at *b*, the violet ray will be refracted more from the perpendicular *bx* than the red ray, and the refracted angle *xbm* will be greater than the refracted angle *xbo*. From hence it follows, that theſe two rays, after emerſion, will diverge from one another. In like manner, the rays that emerge at *d* will diverge from one another; a red ray will emerge in the line *dp*, a violet ray in the line *dt*. So that though all the effectual red rays of the beam *bdmt* are parallel to one another, and all the effectual red rays of the beam *bdop* are likewiſe parallel to one another, yet the violet rays will not be parallel to the red ones, but the violet beam will diverge from the red beam. Thus the rays of different colours will be ſeparated from one another.

This will appear farther, if we conſider what the propoſition affirms, That any violet or moſt refrangible ray will make a greater angle with the incident rays, than any red or leaſt refrangible ray makes with the ſame incident rays. Thus if *yw* is an incident ray, *bm* a violet ray emerging from the point *b*, and *bo* a red ray emerging from the ſame point; the angle which the violet ray makes with the incident one is *yrm*, and that which the red ray makes with it is *yso*. Now *yrm* is a greater angle than *yso*. For in the triangle *brs* the internal angle *brs* is leſs than *bsy* the external angle at the baſe. Euc. b. I. prop. 16. But *yrm* is the complement of *brs* or of *bry* to two right ones, and *yso* is the complement of *bsy* to two right ones. Therefore, ſince *bry* is leſs than *bsy*, the complement of *bry* to two right angles will be greater than the complementy of *bsy* to two right angles; or *yrm* will be greater than *yso*.

Or otherwiſe: Both the rays *bo* and *bm*, when they are refracted in paſſing out of the drop at *b*, are turned round upon the point *b* from the perpendicular *bx*. Now either of theſe lines *bo* or *bm* might be turned round in this manner, till it made a right angle with *yw*. Conſequently, that ray which is moſt turned round upon *b*, or which is moſt refracted, will make an angle with *yw* that will be nearer to a right one than that ray makes with it which is leaſt turned round upon *b*, or which is leaſt refracted. Therefore that ray which is moſt refracted will make a greater angle with the incident ray than that which is leaſt refracted.

But ſince the emerging rays, as they are differently refrangible, make different angles with the ſame incident ray *yw*, the refraction which they ſuffer at emerſion will ſeparate them from one another.

The angle *yrm*, which the moſt refrangible or violet rays make with the incident ones, is found by calculation to be 54 degrees 7 minutes; and the angle *yso*, which the leaſt refrangible or red rays make with the incident ones, is found to be 50 degrees 57 minutes: the angles, which the rays of the intermediate colours, indigo, blue, green, yellow, and orange, make with the incident rays, are intermediate angles between 54 degrees 7 minutes and 50 degrees 57 minutes.

If a line is ſuppoſed to be drawn from the centre of the ſun through the eye of the ſpectator; the angle, which, after two refractions and two reflections, any effectual ray makes with the incident ray, will be equal to the angle which it makes with that line.

If *yw*, (No 45.) is an incident ray, *bo* an effectual ray, and *qn* a line drawn from the centre of the ſun through *o* the eye of the ſpectator; the angle *yso*, which the effectual ray makes with the incident ray, is equal to *son* the angle which the ſame effectual ray makes with the line *qn*. For *yw* and *qn*, conſidered as drawn from the centre of the ſun, are parallel; *bo* croſſes them, and conſequently makes the alternate angles *yso*, *son*, equal to one another. Euc. b. I. prop. 29.

When the ſun ſhines upon the drops of rain as they are falling; the rays that come from thoſe drops to the eye of a ſpectator, after two reflections and two refractions, produce the ſecondary rainbow.

The ſecondary rainbow is the outermoſt CHD, No. 46. When the ſun ſhines upon a drop of rain H; and the rays HO, which emerge at H ſo as to be effectual, make an angle HOP of 54 degrees 7 minutes with LOP a line drawn from the ſun through the eye of the ſpectator; the ſame effectual rays will make likewiſe an angle of 54 degrees 7 minutes with the incident rays S, and the rays which emerge at this angle are violet ones, by what was obſerved above. Therefore, if the ſpectator's eye is at O, none but violet rays will enter it: for as all the other rays make a leſs angle with OP, they will fall above the ſpectator's eye. In like manner, if the effectual rays that emerge from the drop G make an angle of 50 degrees 57 minutes with the line OP, they will likewiſe make the ſame angle with the incident rays S; and conſequently, from the drop G to the ſpectator's eye at O, no rays will come but red ones; for all the other rays, making a greater angle with the line OP, will fall below the eye at O. For the ſame reaſon, the rays emerging from the intermediate drops between H and G, and coming to the ſpectator's eye at O, will emerge at intermediate angles, and therefore will have the intermediate colours. Thus, if there are ſeven drops from H to G incluſively, their colours will be violet, indigo, blue, green, yellow, orange and red. This coloured line is the breadth of the ſecondary rainbow.

Now, if HOP was to turn round upon the line OP, like a pair of compaſſes upon one of the legs OP with the opening HOP, it is plain from the ſuppoſition, that, in ſuch a revolution of the drop H, the angle HOP would be the ſame,

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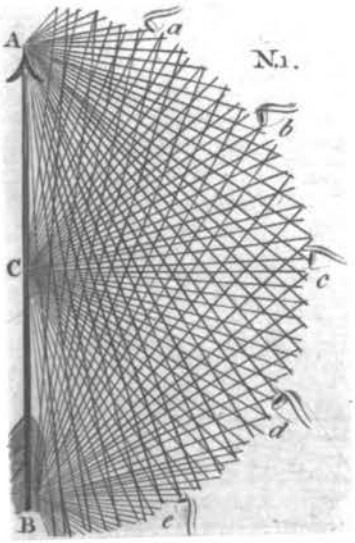

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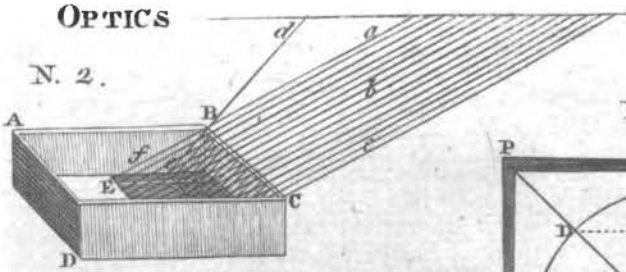

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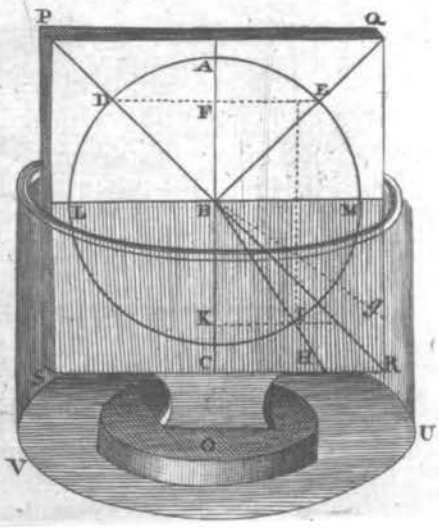

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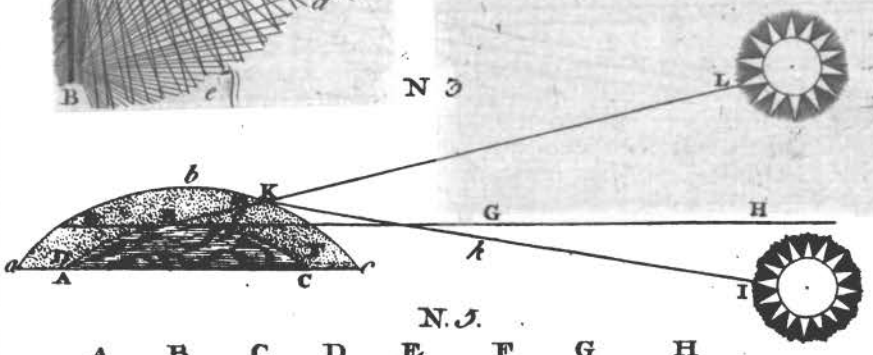

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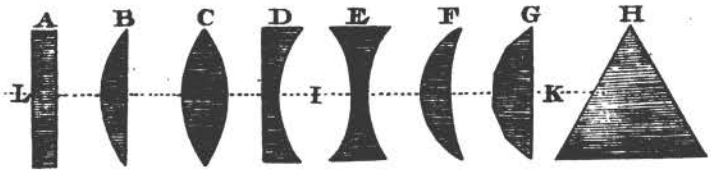

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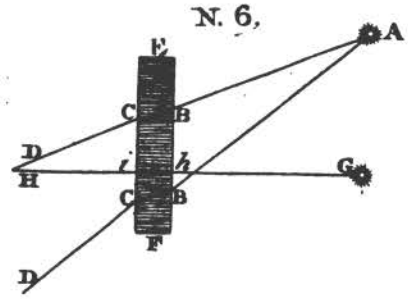

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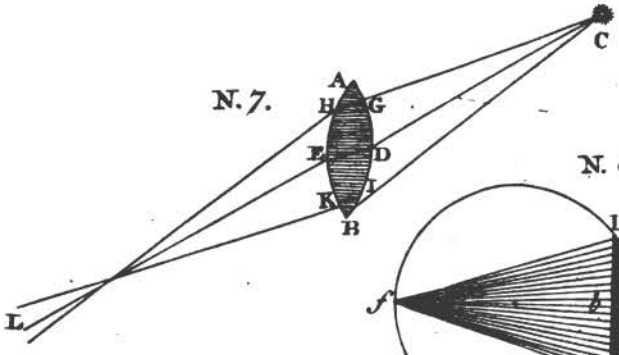

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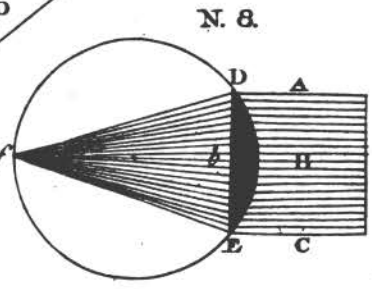

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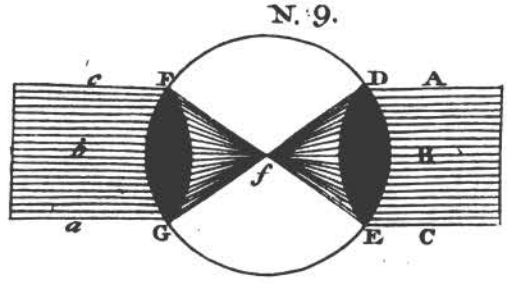

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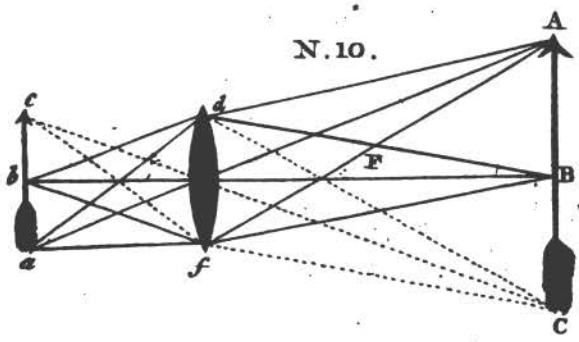

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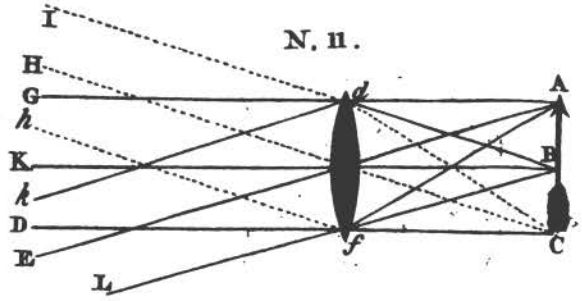

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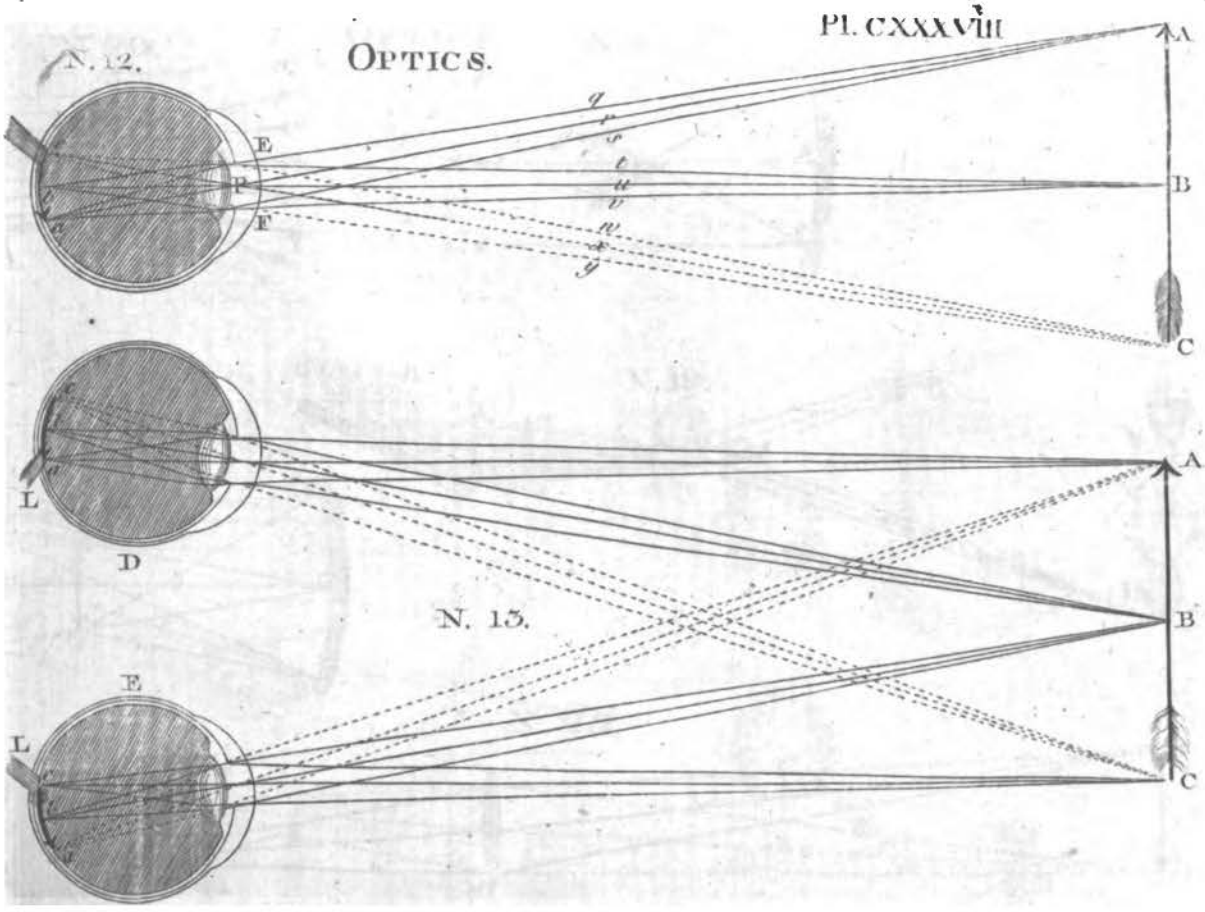

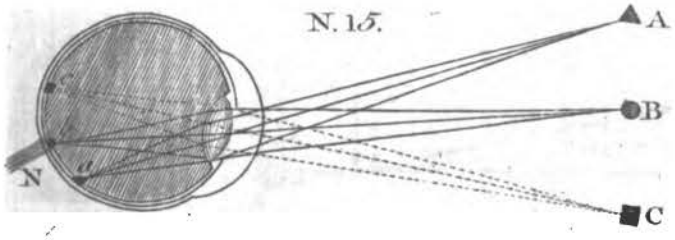

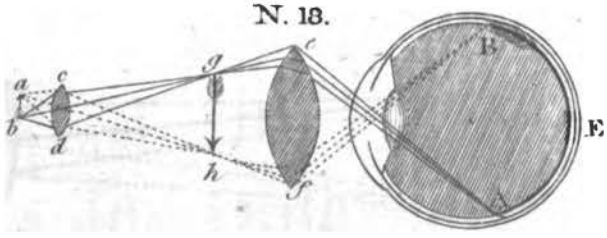

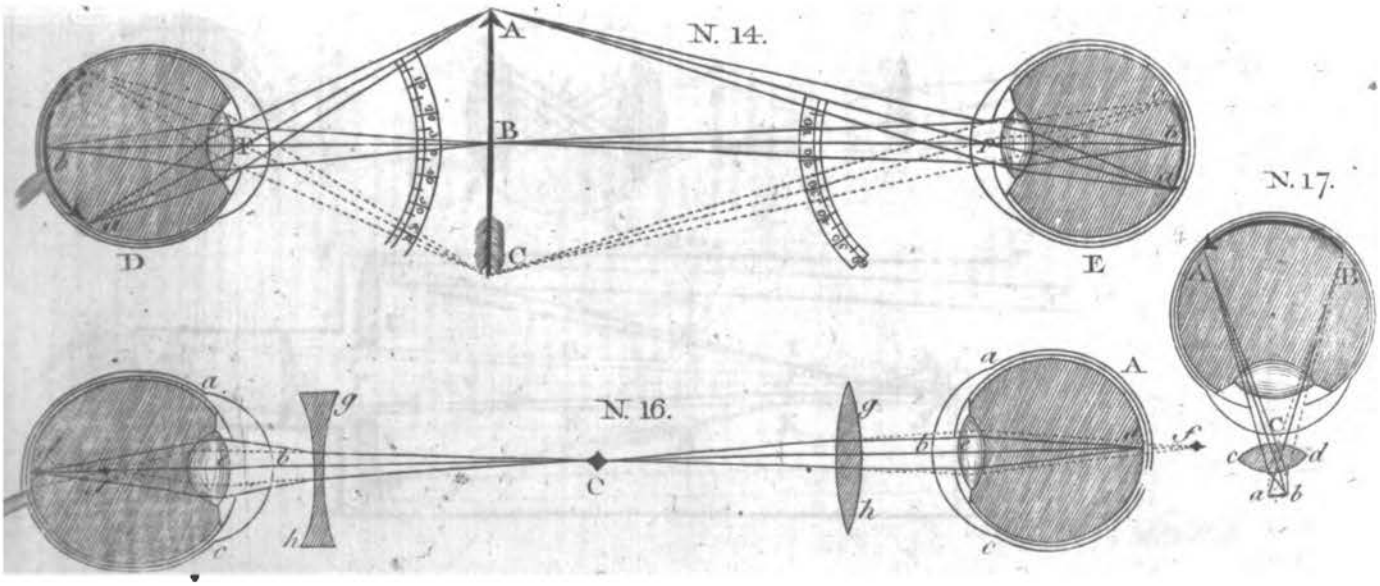

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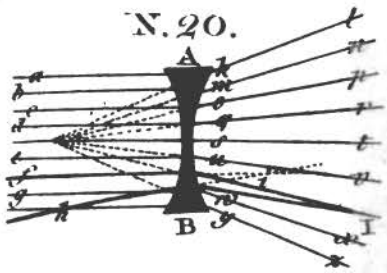

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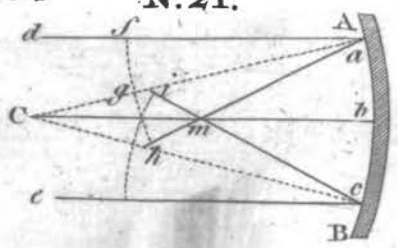

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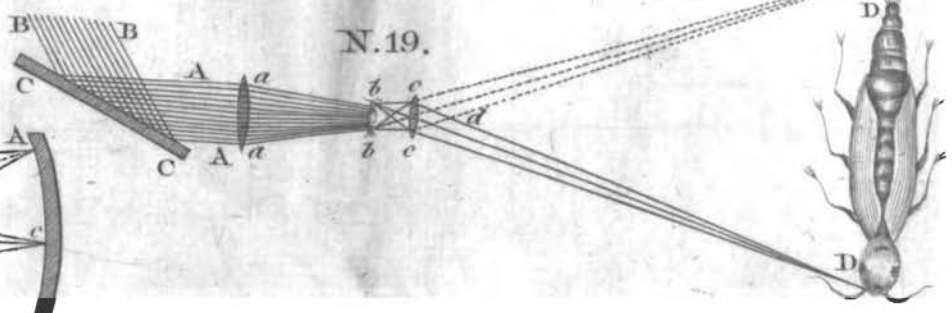

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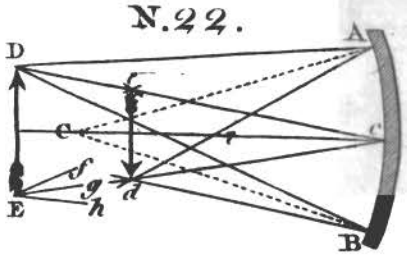

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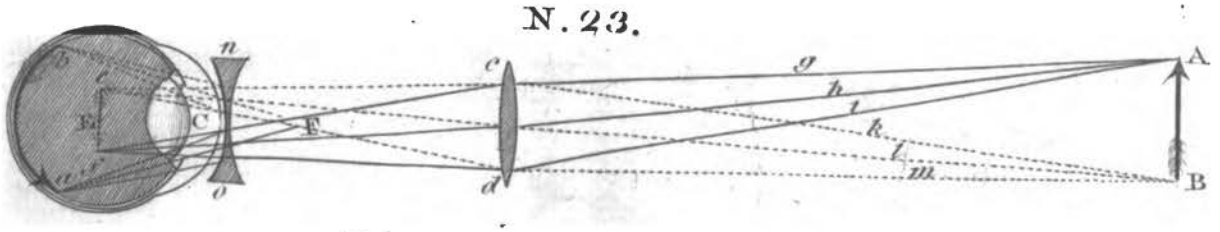

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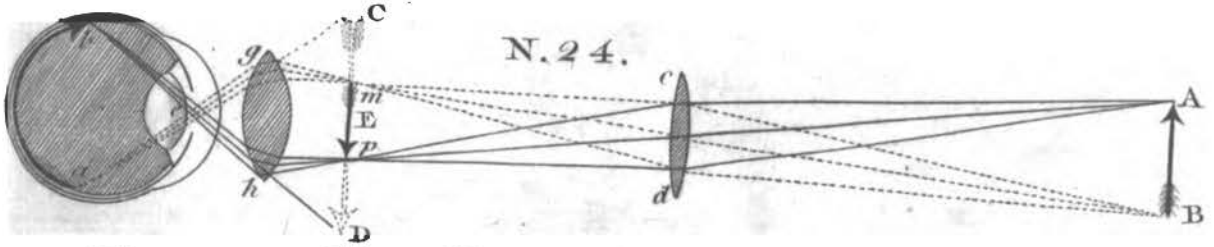

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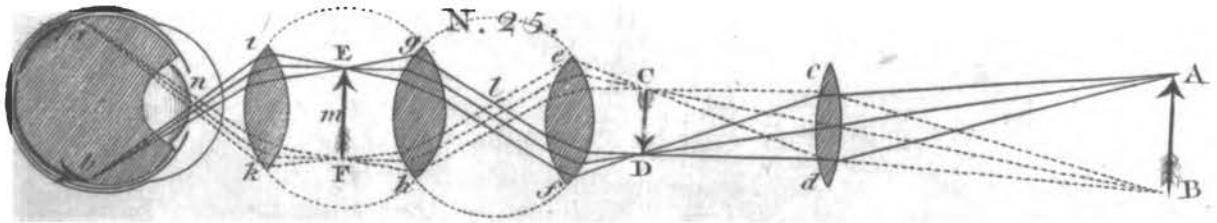

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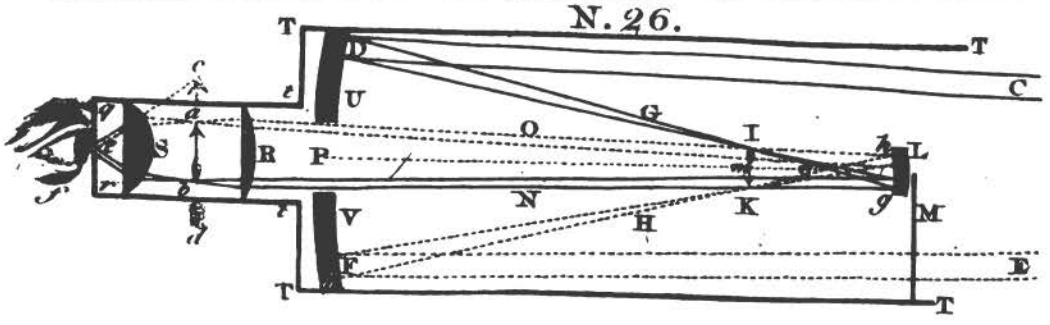

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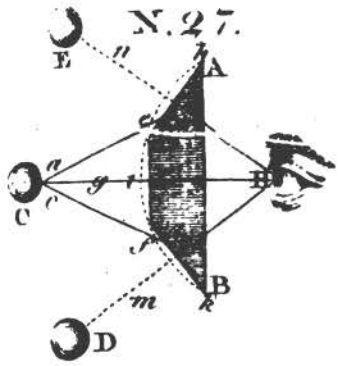

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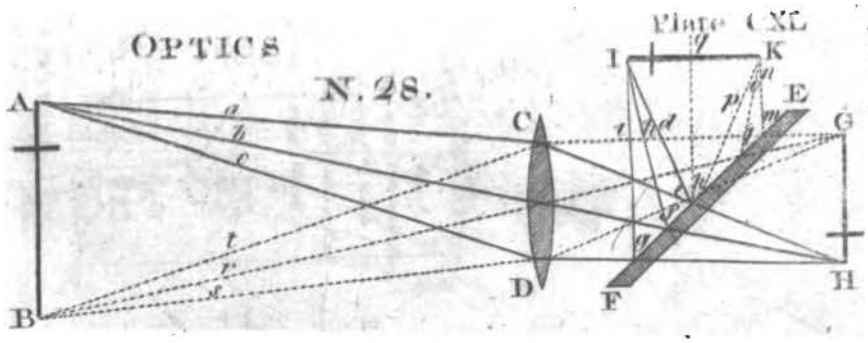

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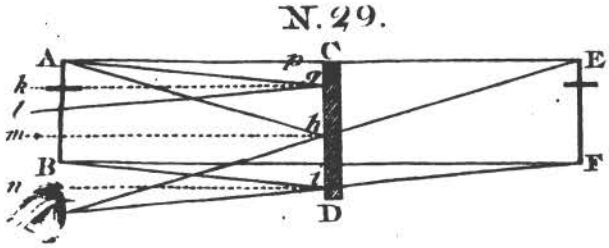

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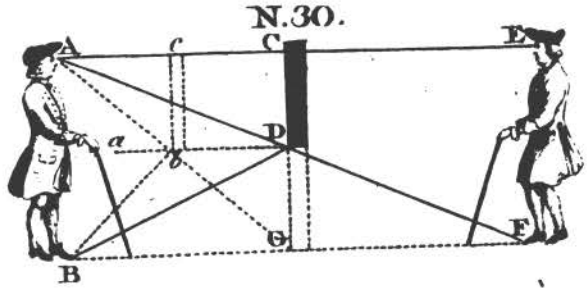

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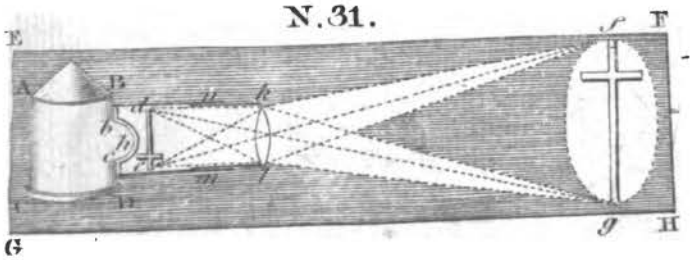

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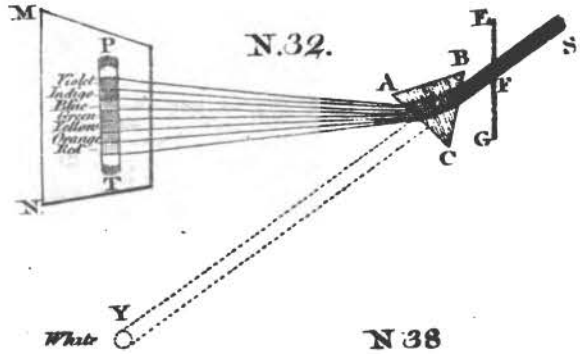

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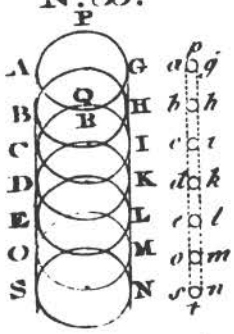

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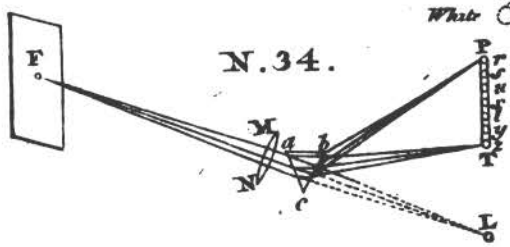

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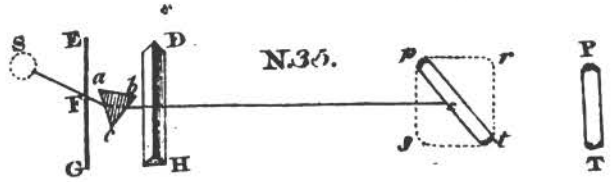

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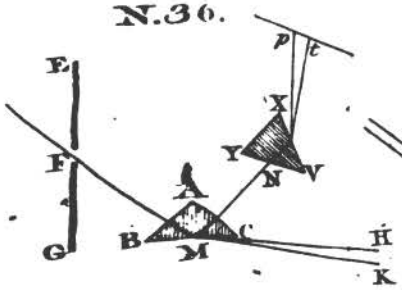

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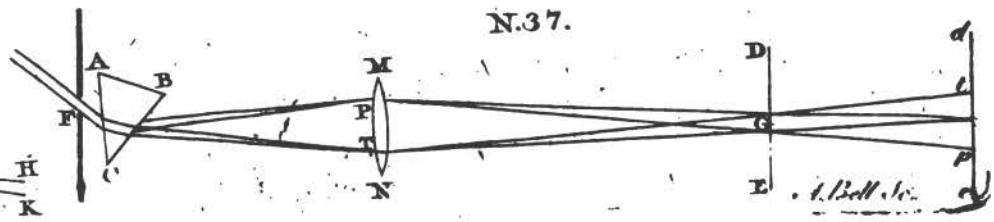

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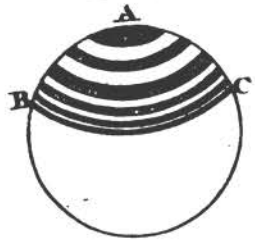

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OPTICS.

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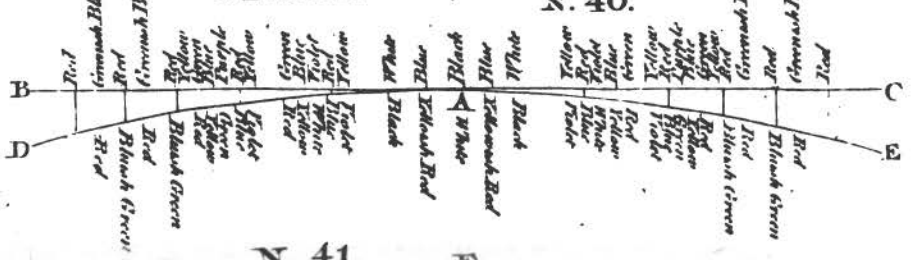

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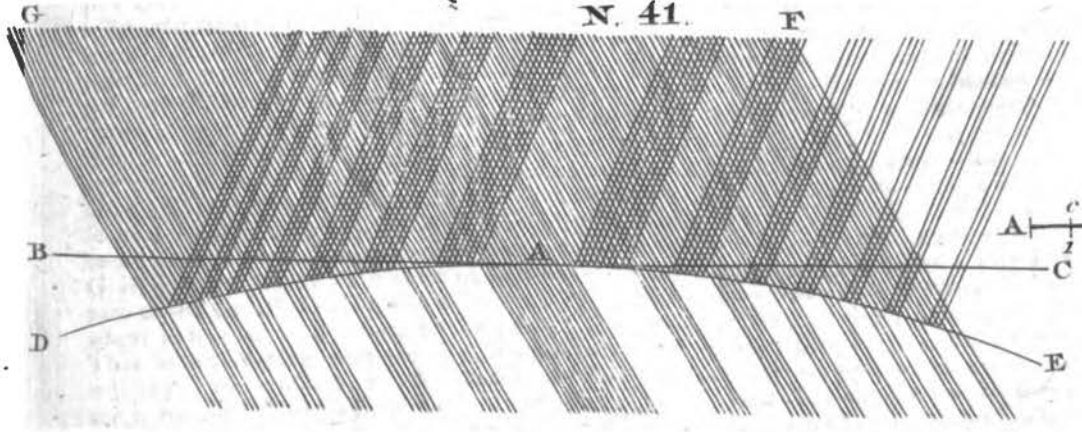

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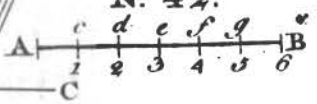

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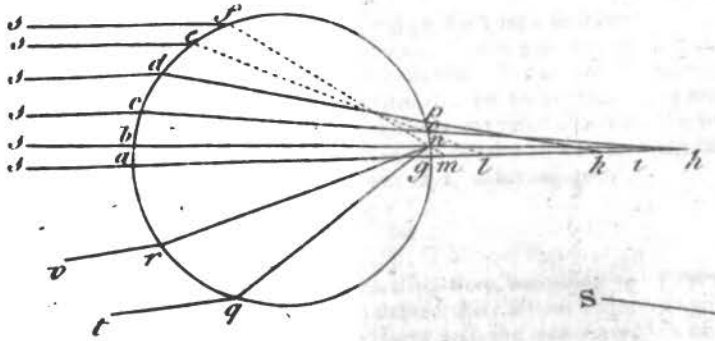

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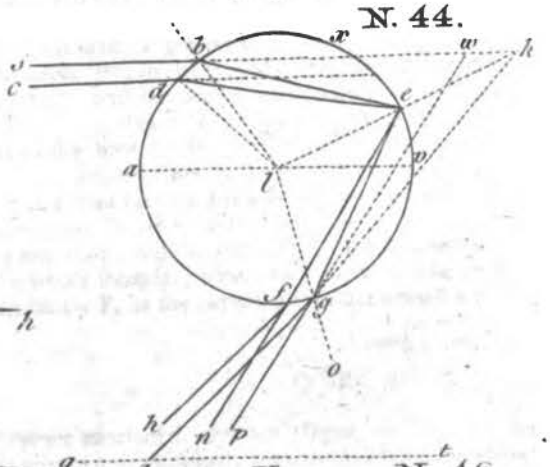

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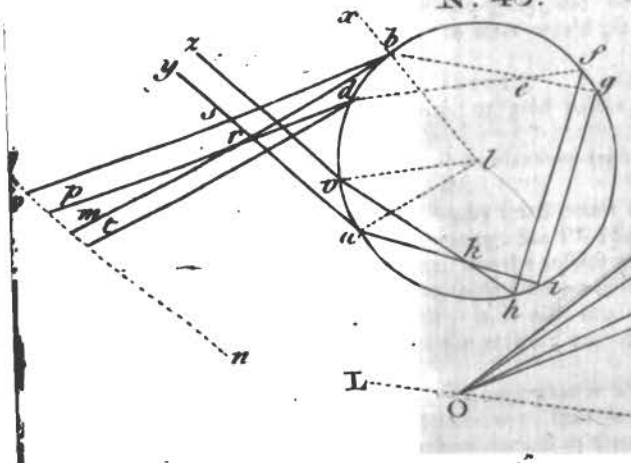

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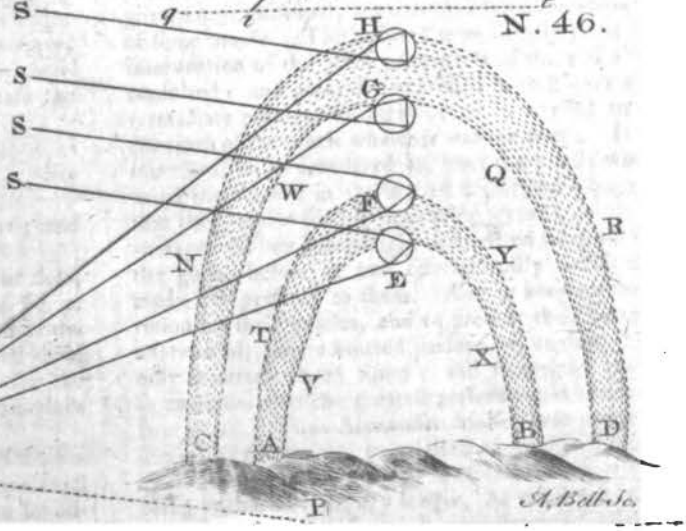

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ſame, and conſequently the emerging rays would make the ſame angle with the incident ones. But in ſuch a revolution the drop would deſcribe a circle of which P would be the centre and CNHRD an arc. Conſequently, ſince, when the drop is at N, or at R, or any where elſe in that arc, the emerging rays make the ſame angle with the incident ones as when the drop is at H, the colour of the drop will be the ſame to an eye placed at O, whether the drop is at N, or at H, or at R, or any where elſe in that arc. Now, though the drop does not thus turn round as it falls, and does not paſs through the ſeveral parts of this arc, yet, ſince there are drops of rain falling every where at the ſame time, when one drop is at H, there will be another at R, another at N, and others in all parts of the arc; and theſe drops will all of them be violet-coloured, for the ſame reaſon that the drop H would have been of this colour if it had been in any of thoſe places. In like manner, as the drop G is red when it is at G, it would likewiſe be red in any part of the arc CWGQD; and ſo will any other drop, when, as it is falling, it comes to any part of that arc. Thus as the ſun ſhines upon the rain, whilſt it falls, there will be two arcs produced, a violet coloured one CNHRD, and a red one CWGQD; and for the ſame reaſons the intermediate ſpace between theſe two arcs will be filled up with arcs of the intermediate colours. All theſe arcs together make up the ſecondary rainbow.

The colours of the ſecondary rainbow are fainter than thoſe of the primary rainbow; and are ranged in the contrary order.

The primary rainbow is produced by ſuch rays as have been only once reflected; the ſecondary rainbow is produced by ſuch rays as have been twice reflected. But at every reflection ſome rays paſs out of the drop of rain without being reflected; ſo that the oftener the rays are reflected, the fewer of them are left. Therefore the colours of the ſecondary bow are produced by fewer rays, and conſequently will be fainter, than the colours of the primary bow.

In the primary bow, reckoning from the outſide of it, the colours are ranged in this order; red, orange, yellow, green, blue, indigo, violet. In the ſecondary bow, reckonign from the outſide, the colours are violet, indigo, blue, green yellow, orange, red. So that the red, which is the outermoſt or higheſt colour in the primary bow, is the innermoſt or loweſt colour in the ſecondary one.

Now the violet rays, when they emerge ſo as to be effectual after one reflection, make a leſs angle with the incident rays than the red ones; conſequently the violet rays make a leſs angle with the lines OP, (No. 46.) than the red ones. But in the primary rainbow the rays are only once reflected, and the angle which the effectual rays make with OP is the diſtance of the coloured drop from P the centre of the bow. Therefore the violet drops or violet arc in the primary bow will be nearer to the centre of the bow, than the red drops or red arc; that is, the innermoſt colour in the primary bow will be violet, and the outermoſt colour will be red. And, for the ſame reaſon, through the whole primary bow, every colour will be nearer to the centre P, as the rays of that colour are more refrangible.

But the violet rays, when they emerge ſo as to be effectual after two reflections, make a greater angle with the incident rays than the red ones; conſequently the violet rays will make a greater angle with the line OP, than the red ones. But in the ſecondary rainbow the rays are twice reflected, and the angle which effectual rays make with OP is the diſtance of the coloured drop from P the centre of the bow. Therefore the violet drops or violet arc in the ſecondary bow will be farther from the centre of the bow than the red drops or red arc; that is, the outermoſt colour in the ſecondary bow will be violet. and the innermoſt colour will be red. And, for the ſame reaſon, thro' the whole ſecondary bow, every colour will be further from the centre P, as the rays of that colour are more refrangible.

ORA

OPTIMATES, in Roman antiquity, were, according to Tully, the beſt citizens, who deſired their actions might be approved of by the better ſort; and the populares, thoſe who, out of a thirſt of vain-glory, did not conſider ſo much what was right, as what would pleaſe the populace.

OPUNTIA, in botany. See CACTUS.

OR, in heraldry, denotes yellow, or gold colour. See COLOUR and METAL.

In the coats of noblemen, it is blazoned topaz; and in thoſe of ſovereign princes, ſol.

It is repreſented in engraving by ſmall points or dots, ſcattered all over the field or bearing. See Pl. 134. fig. 5.

ORACLE, among the heathens, was the anſwer which the gods were ſuppoſed to give to thoſe who conſulted them upon any affair of importance; it is alſo uſed for the god who it was thought gave the anſwer, and the place where it was given.

The credit of oracles was ſo great, that in all doubts and diſputes their determinations were held ſacred and inviolable: whence vaſt numbers flocked to them for advice about the management of their affairs; and no buſineſs of any conſequence was undertaken, ſcarce any peace concluded, any war waged, or any new form of government inſtituted, without the advice and approbation of ſome oracle. The anſwers were uſually given by the intervention of the prieſt or prieſteſs of the god who was conſulted; and generally expreſſed in ſuch dark and intermediate phraſes, as might be eaſily wreſted to prove the truth of the oracle whatever was the event. It is not, therefore, to be wondered at, that the prieſts who delivered them were in the higheſt credit and eſteem; and that they improved this reputation greatly to their advantage. They accordingly allowed no man to conſult the gods, before he had offered coſtly ſacrifices, and made rich preſents to them. And to keep up the veneration for their oracles, and to prevent their being taken unprepared, they admitted perſons to conſult the gods only at certain ſtated times; and ſometimes they were ſo cautious, that the greateſt perſons could obtain no anſwer at all. Thus Alexander himſelf was peremptorily denied by the pythia, or prieſteſs of Apollo, till ſhe was, by downright force, obliged to aſcend the tripos; when, being unable to reſiſt any longer, ſhe cried out, *thou art invincible*; and theſe words were accepted inſtead of a farther oracle. See MYTHOLOGY.

ORACH,

ORACH, in botany. See ATRIPLEX.

ORAL, ſomething delivered by word of mouth, without being committed to writing; in which ſenſe we ſay, oral law, oral tradition, *&c.*

ORANGE-TREE, in botany. See CITRUS.

ORANGE; in geography, a city of Provence, in France, capital of the principality of Orange: it is ſituated on the eaſt ſide of the river Rhone, ſeventeen miles north of Avignon: E. long. 4° 46′, N. lat. 44° 10′.

ORATION, in rhetoric, a ſpeech or harangue, compoſed according to the rules of oratory, and ſpoken in public.

Orations may be all reduced to three kinds, *viz.* the demonſtrative, deliberative, and judicial. To the demonſtrative kind belong panegyrics, genethliaca, epithalamia, congratulations, *&c.* To the deliberative kind belong perſuaſion, exhortation, *&c.* And to the judicial kind belong accuſation, confutation, *&c.*

ORATORIO, in the Italian muſick, a ſort of ſacred drama of dialogues; containing recitativos, duettos, trios, ritornellos, choruſes, *&c.*

The ſubjects of theſe pieces are uſually taken from the ſcriptures, or from the life of ſome ſaint, *&c.*

The muſick for the oratorio ſhould be in the fineſt taſte, and beſt choſen ſtrains. Theſe oratorios are greatly uſed at Rome, in time of lent; and of late, in England.

ORATORY. See RHETORIC.

ORATORY, among the Romaniſts, a cloſet or like apartment near a bed-chamber, furniſhed with an altar, crucifix, *&c.* for private devotion.

ORB, in aſtronomy, *&c.* denotes an hollow globe or ſphere.

ORBICULARIS, in anatomy. See ANATOMY, p. 306.

ORBIS, in ichthyology, a name given to two ſpecies of oſtracion, nearly as broad as long, and covered with ſpines. See OSTRACION.

ORBIS MAGNUS, in aſtronomy, denotes the earth's orbit, in its annual revolution round the ſun.

ORBIT, in aſtronomy, the path of a planet or comet, or the curve that it deſcribes in its revolution round its central body: thus the earth's orbit is the curve which it deſcribes in its annual courſe, and uſually called the ecliptic. See ASTRONOMY.

ORCADES, the ORKNEY-ISLANDS. See ORKNEY.

ORCHARD, a plantation of fruit-trees. See GARDENING.

ORCHESTRA, in the ancient theatres, a place in the form of a ſemi-circle, where the dancing was performed.

In the Greek theatres, the orcheſtra made part of the ſtage; but, among the Romans, it anſwered nearly to our pit; only that in it were diſpoſed the ſeats for the ſenators, magiſtrates, veſtals, and other perſons of diſtinction.

ORCHIS, in botany, a genus of the gynandria diandria claſs. The nectarium is ſhaped like a horn behind the flower. There are 32 ſpecies, 12 of them natives of Britain. The root of the morio, or female fool-ſtones, has been celebrated as an aphrodiſiac, but without any ſolid foundation.

ORDEAL, a form of trial, or of diſcovering innocence or guilt, formerly practiſed over almoſt all Europe, and which prevailed in England from the time of Edward the Confeſſor, till it was aboliſhed by a declaration of Henry III. It was called purgatio vulgaris, or judicium; in oppoſition to bellum or combat, the other form of purgation; and was of various kinds, as that of fire, that of red hot-iron, that of water, that of judicial pottage, that of hallowed cheeſe, that of the green croſs, and that of dice laid on relics covered with a woollen cloth. To each of which kinds particular maſſes were appointed.

In England, an offender, on being arraigned and pleading not guilty, had it in his choice to put himſelf upon God and his country; that is, upon the verdict of a jury; or upon God alone, on which account it was called the judgment of God, it being preſumed that God would deliver the innocent. The more popular kinds of ordeal were thoſe of red-hot iron and water; the firſt for freemen and people of faſhion, and the laſt for peaſants. That by fire, as practiſed here, was the perſon's walking bare-footed and blindfold over nine red-hot ploughſhares; and if he eſcaped unhurt, he was acquitted; otherwiſe, condemned. That of water was of two kinds, *viz.* either with hot water, or cold: the former was where the perſon ſuſpected put his arm or leg into ſcalding water, and brought it out unhurt; and the latter was when his body was not, contrary to the courſe of nature, borne up by the water.

ORDER, in architecture, is a ſyſtem of the ſeveral members, ornaments, and proportions of columns and pilaſters; or a regular arrangement of the projecting parts of a building, eſpecially the column, ſo as to form one beautiful whole. See ARCHITECTURE.

ORDER is alſo uſed for a diviſion or claſs of any thing: thus, the tribe of animals called birds is ſubdivided into ſix orders. See NATURAL HISTORY, and BOTANY.

Holy ORDERS, a character peculiar to eccleſiaſtics, whereby they are ſet apart for the miniſtry. See ORDINATION.

Military ORDERS, are companies of knights, inſtituted by kings and princes; either for defence of the faith, or to confer marks of honour, and make diſtinctions among their ſubjects.

Religious ORDERS, are congregations or ſocieties of monaſtics, living under the ſame ſuperior, in the ſame manner, and wearing the ſame habit.

ORDINAL, a book containing the order or manner of performing divine ſervice.

ORDINANCE, or ORDONNANCE, a law, ſtatute, or command of a ſovereign or ſuperior: thus the acts of parliament are ſometimes termed ordinances of parliament.

ORDINARY, in civil law, is any judge inveſted with authority to take cognizance of cauſes in his own right, and not by deputation.

ORDINARY, or *honourable* ORDINARY, in heraldry, a denomination given to certain charges properly belonging to that art. The honourable ordinaries are ten in number; *viz.* the chief, pale, bend, feſſe, bar, croſs, ſaltier, chevron, bordure, and orle. For which ſee the articles CHIEF, PALE, *&c.*

ORDINATES. See CONIC SECTIONS.

ORDINATION, the act of conferring holy orders, or of initiating a perſon into the prieſthood by prayer and the laying on of hands.

ORDNANCE, a general name for all ſorts of great guns uſed in war. See GUNNERY.

Office of ORDNANCE, an office kept within the tower of London, which ſuperintends and diſpoſes of all the arms, inſtruments, and utenſils of war, both by ſea and land, in

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in all the magazines, garriſons, and forts, in Great Britain.

ORDONNANCE, in architecture, is the compoſition of a building, and the diſpoſition of its parts, both with regard to the whole and to one another; or, as Mr. Evelyn expreſſes it, determining the meaſure of what is aſſigned to the ſeveral apartments.

ORE, in natural hiſtory, the compound mineral glebe, earth, ſtone, or other ſubſtance, which is rich enough in metallic particles to be worth the while of being purified, and by this means to ſeparate the metal from it, whether gold, ſilver, copper, *&c.* See CHEMISTRY.

OREBRO, the capital of the province of Nericia, in Sweden: E. long. 15°, N. lat. 59° 20′.

OREGRUND, a port-town of Sweden, in the province of Upland: E. long. 18° 15′, N. lat. 60° 30′.

ORFORD, a borough and port town of Suffolk, thirty miles eaſt of Bury. It ſends two members to parliament.

ORGAL, among dyers, denotes the lees of wine dried.

ORGAN, in general, is an inſtrument or machine deſigned for the production of ſome certain action or operation; in which ſenſe, the mechanic powers, machines, and even the veins, arteries, nerves, muſcles, and bones of the human body, may be called organs.

ORGAN, in muſick, the largeſt and moſt harmonious wind-inſtrument.

The invention of the organ is very ancient, though it is agreed that it was very little uſed till the eighth century. It ſeems to have been borrowed from the Greeks. Vitruvius deſcribes an hydraulic one in his tenth book of architecture. The emperor Julian has an epigram in its praiſe. St. Jerome mentions one with twelve pair of bellows, which might be heard a thouſand paces, or a mile; and another at Jeruſalem, which might be heard at the mount of Olives.

There is one in the cathedral church of Ulm, in Germany, that is ninety-three feet high, and twenty-eight broad; the biggeſt pipe is thirteen inches in diameter; and it has ſixteen pair of bellows.

The modern organ is a buffet, containing ſeveral rows of pipes. The ſize of the organ is generally expreſſed by the length of its biggeſt pipe; thus we ſay an organ of thirty-two feet, of ſixteen, of eight, and of two feet.

Hydraulic ORGAN, denotes a muſical machine that plays by means of water inſtead of wind. Of theſe there are ſeveral in Italy in the grottoes of vineyards. Cteſebes of Alexandria, who lived in the time of Ptolemy Eurgetes, is ſaid to have firſt invented organs that played by compreſſing the air with water, as is ſtill practiſed. Archimedes and Vitruvius have left us deſcriptions of the hydraulic organ.

ORGASM, an ecſtacy, or impetuous deſire of coition, occaſioned by a turgeſcency of the ſeminal veſſels.

ORGIA, in antiquity, feaſts and ſacrifices performed in honour of Bacchus, inſtituted by Orpheus, and chiefly celebrated on the mountains by wild diſtracted women, called Bacchæ. See BACCHANALIA, and DIONYSIA.

ORGIVA, a town of Spain, in the province of Granada, twenty-five miles ſouth of Granada.

ORGUES, in the military art, are thick, long pieces of wood, pointed at one end, and ſhod with iron, clear one of another; hanging each by a particular rope, or cord, over the gate-way of a ſtrong place, perpendicularly, to be let fall in caſe of an enemy.

ORGUES is alſo uſed for a machine, compoſed of ſeveral harquebuſs or muſquet-barrels bound together, by means whereof ſeveral exploſions are made at the ſame time, uſed to defend breaches and other places attacked.

ORGYA, an ancient Grecian meaſure, containing ſix feet.

ORIA, a town of Italy, in the kingdom of Naples, and territory of Otranto, ſituated thirty miles north-weſt of the city of Otranto.

ORIFICE, the mouth or aperture of a tube, pipe, or other cavity.

ORIGANUM, in botany, a genus of the didynamia gymnoſpermia claſs. The ſtrobilus is triangular and ſpiked. There are eleven ſpecies, two of which are natives of Britain, *viz.* the vulgare, or wild marjoram; and the onites, or pot-marjoram.

ORIGENISTS, in church-hiſtory, a Chriſtian ſect in the fourth century, ſo called from their drawing their opinions from the writings of Origen. The origeniſts maintained, that the ſouls of men had a pre-exiſtent ſtate; that they were holy intelligences, and had ſinned in heaven before the body was created: that Chriſt is only the ſon of God by adoption: that he has been ſucceſſively united with all the angelical natures, and has been a cherub, a ſeraph, and all the celeſtial virtues, one after another: that in future ages, he will be crucified for the ſalvation of the devils, as he has already been for that of men; and that their puniſhment, and that of the damned, will continue only for a certain limited time.

ORIGINAL, a firſt draught or deſign of any thing, which ſerves as a model to be imitated or copied.

ORIGINAL SIN, the crime of eating the forbidden fruit, of which it is ſaid all mankind are guilty at their conception by the imputation of Adam's tranſgreſſion; which is accounted for by ſuppoſing, that Adam, as he was to be the father, was alſo the fœderal head and repreſentative, of the whole human race; and that on his ſinning, all that were to ſpring from him partook of his crime.

ORIGUELLA, a city of Spain, in the province of Valencia: W. long. 50′, N. lat. 38° 20′.

ORILLON, in fortification, is a ſmall rounding of earth faced with a wall; raiſed on the ſhoulder of thoſe baſtions that have caſemates, to cover the cannon in the retired flank, and prevent their being diſmounted by the enemy. See FORTIFICATION.

ORIOLUS, in ornithology, a genus belonging to the order of picæ. The bill is conical, convex, very ſharp, and ſtrait, the ſuperior mandible being much longer than the under one; and the tongue is forked and ſharp. There are 20 ſpecies, principally diſtinguiſhed by their colour.

ORION, in aſtronomy. See ASTRONOMY, p. 487.

ORIXA, the capital of the province of the ſame name, in the hither India, ſituated on the weſt ſide of the bay of Bengal.

ORKNEY ISLANDS, certain iſlands on the north of Scotland, from which they are ſeparated by a frith twenty miles in length, and ten in breadth. Theſe iſlands are forty in number, and together with the iſland of Zetland ſend one member to parliament, and another for the burghs of Kirkwall, *&c.*

ORLE, ORLET, or ORLO, in architecture, a fillet under the ovolo or quarter round of a capital. When it is at the top or bottom of the ſhaft, it is called cincture.

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Palladio uſes the word orlo, for the plinth of the baſes of the columns.

ORLE, in heraldry, an ordinary, in form of a fillet, drawn round the ſhield, near the edge or extremity thereof, leaving the field vacant in the middle. Its breadth is but half that of the treſſure or bordure, which contains a ſixth part of the ſhield; and the orle, only a twelfth: beſides that the orle is its own breadth diſtant from the edge of the ſhield, whereas the bordure comes to the edge itſelf. The form of the orle is the ſame with that of the ſhield, whence it reſembles an eſcutcheon. See Plate CXXXIV. fig. 6. which repreſents an orle argent in a field gules.

ORLEANOIS, a province or government of France, bounded by Normandy and the iſle of France, on the north; by Champaign and Burgundy, on the eaſt; by Lyonois and Guienne, on the ſouth; and by Britany and the bay of Biſcay, on the weſt.

ORLEANS, a city of France, capital of Orleanois, ſituated on the river Loire, in E. long. 2°, N. lat. 47° 55′.

ORLEANS is alſo the name of an iſland and town on the river of St. Laurence, in Canada: W. long. 73°, N. lat. 47°.

ORLOPE, in the ſea-language, the uppermoſt ſpace or deck in a great ſhip, reaching from the main-maſt to the mizen. In three-deck ſhips, the ſecond and loweſt decks are ſometimes called orlopes.

ORMOND, the north diviſion of the county of Tipperary in Ireland.

ORMUS, an iſland at the entrance of the gulph of Perſia, ſituated oppoſite to Gombron on the continent, in E. long. 56°, N. lat. 27° 30′.

This iſland is thirty miles in circumference.

ORNITHOGALUM, in botany, a genus of the hexandria monogynia claſs. The corolla conſiſts of ſix erect petals; and the filaments are alternately wider at the baſe. There are 11 ſpecies, three of them natives of Britain, *viz.* the luteum, or yellow ſtar of Bethlehem; the pyrenaicum, or ſpiked ſtar of Bethlehem; and the umbellatum, or common ſtar of Bethlehem.

ORNITHOLOGY, that branch of natural hiſtory which treats of birds. See NATURAL HISTORY.

ORNITHOMANCY, a ſpecies of divination, performed by means of birds; being the ſame with augury. See DIVINATION and AUGURY.

ORNIOPHTUS, in botany, a genus of the diadelphia decandria claſs. The pod is jointed, cylindrical, and arcuated. There are four ſpecies, only one of which, *viz.* the perpuſillus, or birds-foot, is a native of Britain.

OROBANCHE, in botany, a genus of the didynamia angioſpermia claſs. The calix is bifid, and the corolla ringent; the capſule has two valves, and contains many ſeeds. There are ſeven ſpecies, two of them natives of Britain, *viz.* the major, or broom-rape; and the ramoſa, or branched broom-rape.

OROBUS, in botany, a genus of the diadelphia decandria claſs. The ſtylus is linear; the calix is blunt at the baſe, the ſuperior ſegments of it being ſhorter. There are nine ſpecies, two of them natives of Britain, *viz.* the tuberoſus, or wood-peaſe; and the ſylvaticus, or bitter vetch.

ORONOQUE, a river of South America, which falls into the Atlantic ocean in 8° N. lat. almoſt oppoſite to the iſland of Trinity.

ORONTIUM, in botany, a genus of the hexandria monogynia claſs. The ſpadix is cylindrical, and covered with floſcules; the corolla conſiſts of ſix petals; it has no ſtylus; and the capſule has three cells. There is but one ſpecies, a native of Virginia.

ORPHAN, a fatherleſs child, or minor; or one that is deprived both of father and mother.

ORPHUS, in ichthyology. See SPARUS.

ORPIMENT, in natural hiſtory, a foſſile ſubſtance uſually found in copper-mines, compoſed of thin flakes, like the talcs; which eaſily ſplit, and are flexible, and not elaſtic, ſoluble in oil, fuſible in a moderate fire, and yielding in burning an offenſive ſmell like garlic.

Of this genus of foſſils, there are only three known ſpecies: 1. A broad-flaked, gold-coloured kind, much eſteemed at preſent by our painters. This is found in ſeveral places, as in the iſlands of the Archipelago, in the mines of Goſſelaer in Saxony, in ſome parts of Turky, and in the Eaſt-Indies, and in its utmoſt purity about Smyrna; this makes the fineſt of all yellows in painting. 2. The ſmall-flaked yellow kind, which is the common orpiment of the ſhops, and is a fine colour, though greatly inferior to the former. This is found in many parts of the Turkiſh dominions, and in Germany. And, 3. Red-orpiment, which is of a fine bright red: this is a very beautiful ſubſtance of a fine bright red, very gloſſy, and a little tranſparent, and is found in the Turkiſh dominions, in the iſlands of the Archipelago, and even in Cornwall, where it is known under the name of red mundic.

Geoffroy declares it a corroſive and poiſonous mineral: on the other hand, Boerhaave declares orpiment an innocent and harmleſs medicine; and Hoffman, who has been at more pains than any body to examine into its nature, declares the ſame, and even gives inſtances of its being given to dogs without any harm.

It is an excellent depilatory, mixed with lime, and made into a paſte with water. The painters are fond of it as a golden colour; and a lixivium of it, with quick-lime, makes ſympathetic ink.

ORPINE, in botany. See SEDUM.

ORRERY, a curious machine, or movement, for repreſenting the motions and appearances of the heavenly bodies. See ASTRONOMY, p. 495.

ORRICE. See IRIS.

ORTEGAL *caſtle and cape*, the moſt northerly promontory of Spain, thirty miles north-eaſt of Ferrol: W. long. 8° 22′, N. lat. 44°.

ORTEGIA, in botany, a genus of the triandria monogynia claſs. The calix conſiſts of five leaves; the corolla is wanting; and the capſule has one cell, and many ſeeds. There is but one ſpecies, a native of Spain.

ORTHODOX, in church-hiſtory, an appellation given to thoſe who are ſound in all the articles of the Chriſtian faith.

ORTHOGRAPHIC *projection of the ſphere*, that wherein the eye is ſuppoſed at an infinite diſtance; ſo called, becauſe the perpendiculars from any point of the ſphere will all fall in the common interſection of the ſphere, with the plane of the projection.

ORTHO-

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ORTHOGRAPHY, that part of grammar which teaches the nature and affections of letters, and the juſt method of ſpelling or writing words with all the proper and neceſſary letters, making one of the four greateſt diviſions or branches of grammar. See GRAMMAR.

ORTHOGRAPHY, in geometry, the art of drawing or delineating the fore-right plan of any object, and of expreſſing the heights or elevations of each part. It is called orthography, from its determining things by perpendicular lines falling on the geometrical plane.

ORTHOGRAPHY, in architecture, the elevation of a building.

ORTHOGRAPHY, in perſpective, is the fore-right ſide of any plane, *i. e.* the ſide or plane that lies parallel to a ſtraight line, that may be imagined to paſs through the outward convex points of the eyes, continued to a convenient length.

ORTHOPNOEA, in medicine, a ſpecies or degree of aſthma, where there is ſuch a difficulty of reſpiration, that the patient is obliged to ſit or ſtand upright, to be able to breathe. See MEDICINE.

ORTON, a market town of Weſtmoreland, ſituated ten miles ſouth-weſt of Appleby.

ORVALA, in botany, a genus of the didynamia gymnoſpermia claſs. The ſuperior lip of the corolla is divided into three ſegments, each being teethed; and the inferior lip is cordated and crenated. There is but one ſpecies, a native of Italy.

ORVIETTO, a city of Italy, in the pope's territories, capital of the province of Orvietto, ſituated at the confluence of the Tiber and the Chiane: E. long. 13°, N. lat. 43°.

ORWELL, a river of Suffolk, which, riſing in the middle of that country, runs ſouth-eaſt by Ipſwich, and falls into the German ſea at Languard-fort.

ORYZA, RICE, in botany, a genus of the hexandria digynia claſs. The calix is a double-valved glume, with one flower; and the corolla conſiſts of two equal valves. There is but one ſpecies.

This plant is cultivated in vaſt abundance in the Eaſt, as alſo in Carolina, for food. It is ſaid to be good in dyſenteries, diarrhœas, *&c.*

OSACA, a great city and port-town of Japan, ſituated on a bay of the ſea, on the eaſt ſide of the iſland: in E. long. 135°, N. lat. 35°.

OSBECKIA, in botany, a genus of the octandria monogynia claſs. The calix conſiſts of four ſegments, and the corolla of four petals; and the capſule has four cells. There is but one ſpecies, a native of India.

OSCHEOCELE, in ſurgery, a hernia of the ſcrotum. See SURGERY.

OSCILLATION, in mechanics, the vibration, or reciprocal aſcent and deſcent of a pendulum. See MECHANICS.

OSMUNDA, in botany, a genus of the cryptogamia filicum claſs. The ſpike is full of branches, and the fructification is round. There are 17 ſpecies, none of them natives of Britain.

OSNABURG, the capital of the biſhopric of the ſame name, in the circle of Weſtphalia: E. long 7° 40′, N. lat. 52° 31′. The territories of this biſhopric, which are forty miles long, and thirty broad, are ſubject to its biſhop: and this biſhopric is alternately held by a proteſtant and papiſt, the proteſtant being always a prince of the houſe of Brunſwic.

OSORNO, a town of Chili in South America: W. long. 80°, S. lat. 41°.

OSPREY. See FALCO.

OSSIFICATION, the formation of bones, but more particularly the converſion of parts naturally ſoft to the hardneſs and conſiſtence of bones. See ANATOMY, p. 148.

OSSORY, the weſt diviſion of Queen's county in Ireland.

OSSUNA, a town of Spain, in the province of Andaluſia, forty miles eaſt of Seville.

OSTAGIO, a town of Italy in the territory of Genoa, fifteen miles north-weſt of Genoa.

OSTEND, a city and port-town of the Auſtrian Netherlands, in the province of Flanders, ſituated twelve miles weſt of Bruges: E. long. 2° 45′, N. lat. 51° 15°.

OSTEOCOLLA, in natural hiſtory, though ſuppoſed by many to be an earth, is truly a cruſtated kind of ſpar, debaſed by earth, and therefore not tranſparent.

It is uſually found coating over vegetable, or other bodies, in form of incruſtations; ſo that the true oſteocolla is a tubular cruſtaceous ſpar, of a very foul and coarſe texture, and carries with it much more of the appearance of a marl than of a ſpecies of ſpar.

The maſſes of oſteocollo, though regularly of the ſame figure, are very different in ſize; ſome of them being not thicker than a crow-quill, and others of five and ſix inches diameter; it is always, however, of a tubular figure, and a wrinkled and rough ſurface.

Oſteocollo is frequent in Germany, where it is found buried near the ſurface of the earth, ſometimes in ſtrata of ſand, but more frequently among marls: it ſhould be choſen for uſe, the pureſt that can be had of a pale brown colour, and of a tolerably cloſe and firm texture.

It has long been famous for bringing on a callus in fractured bones; its name oſteocollo ſignifying the bone-glue, or bone-binder. It is alſo recommended as a diuretic, and as good in the fluor albus: but, at preſent, little regard is paid to it; ſince, if it has any virtues, they muſt be wholly owing to ſpar, which may be given to greater advantage in a purer form.

OSTEOLOGY, that branch of anatomy which treats of the bones. See ANATOMY, Part I.

OSTEOSPERMUM, in botany, a genus of the ſyngeneſia polygamia neceſſaria claſs. The receptacle is naked; it has no pappus; the calix conſiſts of many leaves; and the ſeeds are round and hard. There are five ſpecies, none of them natives of Britain.

OSTIA, a port-town of Italy, in the pope's territories, ſituated at the mouth of the Tiber: E. long. 13°, N. lat. 41° 30′.

OSTRACION, in zoology, a genus of the amphibia nantes claſs. It has ten long, cylindrical, obtuſe teeth in each jaw; the aperture is linear; the body is covered with a bony ſubſtance; and it has no belly-fins. There are nine ſpecies, principally diſtinguiſhed by the angles of their bodies and the number of ſpines near the tail.

OSTRACISM, in Grecian antiquity, denotes the baniſhment of ſuch perſons whoſe merit and influence gave umbrage to the people of Athens, leſt they ſhould attempt any thing againſt the public liberty. It was ſo called, becauſe the peo-

ple

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ple voted a perſon's baniſhment, by writing his name on ſhells, and caſting them into an urn.

OSTRACITES, in natural hiſtory, the name by which authors call the foſſile oyſter-ſhell.

Oſtracites has the ſame medicinal virtues with the belemnites, and lapis judaicus, only in a higher degree; being accounted by Dr. Liſter one of the greateſt known medicines in nephritic caſes: the doſe, in powder, is from half a dram to a dram, in white-wine; and to prevent a ſickneſs at the ſtomach, that ſometimes attends the taking it, one third part of the quantity of powdered chamomile-flowers may be mixed with it.

OSTREA, the OYSTER, in zoology, a genus belonging to the order of vermes teſtacea. The ſhell has two unequal valves; the cardo has no teeth, but a ſmall hollow pit, with tranſverſe lateral ſtreaks. There are 21 ſpecies, principally diſtinguiſhed by peculiarities in their ſhells. The common oiſter is uſed both raw, and variouſly prepared as food.

OSTRICH, in ornithology. See STRUTHIO.

OSWEGO, a town of the Iroquois, in North America, three hundred miles weſt of Albany, in New-York.

OSWESTRY, a market-town in Shropſhire, fifteen miles north-weſt of Shrewſbury.

OSYRIS, in botany, a genus of the diæcia triandria claſs. The calix of both male and female conſiſts of three ſegments; neither of them have any corolla; the female has no ſtylus, but a roundiſh ſtigma; and the drupa has but one cell. There is only one ſpecies, a native of Italy.

OTHONNA, in botany, a genus of the ſyngeneſia polygamia neceſſaria claſs. The receptacle is naked; it has no pappus; and the calix is ſomewhat cylindrical, and conſiſts of many leaves. There are ſeven ſpecies, two of them natives of Britain, *viz.* the paluſtris, or marſh fleabane; and the integrifolia, or mountain ragwort.

OTIS, in ornithology, a genus of birds belonging to the order of grallæ. The ſuperior mandible of the bill is arched; the noſtrils are oval; the tongue is bifid; the feet are made for running, being furniſhed with four toes. There are four ſpecies, principally diſtinguiſhed by their colour.

OTLEY, a market-town, twenty-one miles weſt of York.

OTOQUE, an iſland ſituated in the bay of Panama, from whence the city is furniſhed with proviſions: W. long. 82°, N. lat. 7°.

OTRANTO, a city and archbiſhop's ſee of the kingdom of Naples, ſituated at the entrance of the gulph of Venice: E. long. 19° 15′, N. lat. 40° 12′.

OTTER, in zoology. See MUSTELA.

OTTOMAN, or OTHOMAN, an appellation given to the Turkiſh empire, from Othomannus, or Oſmanhus, the firſt emperor of the preſent family.

OTTONA, or ORTONA, a city of the kingdom of Naples, ſituated on the gulph of Venice: in E. long. 15° 30′, N. lat. 42° 22′.

OVAL, an oblong curvilinear figure, otherwiſe called ellipſis. See CONIC SECTIONS.

OVARIES, in anatomy. See ANATOMY, p. 275.

OVATION, in the Roman antiquity, a leſſer triumph, allowed to commanders for victories won without the effuſion of much blood; or for defeating a mean and inconſiderable enemy. The ſhow generally began at the Albanian mountain, whence the general with his retinue made his entry into the city on foot, with many flutes or pipes ſounding in concert as he paſſed along, and wearing a garland of myrtle as a token of peace. The term ovation, according to Servius, is derived from *ovis*, ſheep, becauſe on this occaſion the conqueror ſacrificed a ſheep, as in triumph he ſacrificed a bull.

OUDENARDE, a town of the Auſtrian Netherlands, in the province of Flanders, ſituated on the river Scheld, thirteen miles ſouth of Ghent.

OUDENBURG, a town of the Auſtrian Netherlands, in the province of Flanders, five miles ſouth-eaſt of Oſtend.

OVERHALE, in the ſea-language. A rope is ſaid to be overhaled ween drawn too ſtiff, or haled the contrary way.

OVER-RAKE, among ſeamen: When a ſhip, riding at anchor, ſo overbeats herſelf into an high ſea, that ſhe is waſhed by the waves breaking in upon her, they ſay the waves over-rake her.

OVERSMAN, in Scots law; a perſon named by arbiters, or by the parties ſubmitters, to determine the matter ſubmitted, in caſe the parties diſagreee in their opinion.

OVERT, the ſame with open: thus an overt act ſignifies an act which, in law, muſt be clearly proved; and ſuch is to be alledged in every indictment for high treaſon.

OVERTURE, or OUVERTURE, opening or preluding; a term uſed for the ſolemnities at the beginning of a public act or ceremony; an opera, tragedy, concert of muſick, *&c.*

The overture of the theatre, or ſcene, is a piece of muſick uſually ending with a fugue: the overture of a jubilee is a general proceſſion, *&c.*

OVERYSCHE, a town of the Auſtrian Netherlands, in the province of Brabant, ſituated on the river Yſche, nine miles north-eaſt of Bruſſels.

OVERYSSEL, one of the united provinces, bounded by Groningen on the north, by Weſtphalia on the eaſt, by Zutphen on the ſouth, and by Guelderland, the Zuyder-ſea, and Frieſland, on the weſt.

OVIEDA, in botany, a genus of the didynamia angioſpermia claſs. The calix conſiſts of five ſegments; the corolla is a long cylindrical tube; and the berry is round, containing two ſeeds. There are two ſpecies, none of them natives of Britain.

OVIEDO, a city of Spain, capital of the province of Aſturias; ſituated on the river Aſta, fifty miles north of Leon, in W. long. 6° 40′, N. lat. 43° 30.

OVILIA, or SEPTA, in ancient Rome, a place in the campus martius, at firſt railed in like a ſheep-pen, whence its name. Afterwards it was mounted with marble, and beautified with walks and galleries, as alſo with a tribunal, or ſeat of juſtice. Within this precinct, or incloſure, the people were called in to give their ſuffrages for the election of magiſtrates. The aſcent into the ovilia was not by ſtairs, but by pontes, or narrow boards, laid there for the occaſion; on which account *de ponte dejici* was to be denied the privilege of voting; and perſons thus dealt with, were called depontani.

OVIPAROUS, a term applied to ſuch animals as bring forth their young from eggs; as birds, inſects, *&c.*

OVIS, in zoology, a genus of the mammalia claſs, and of the order of pecora; the characters of which are theſe: The horns are concave, turned backwards, twiſted, and full of wrinkles; there are eight foreteeth in the under jaw, and no dog-teeth. The ſpecies are three, *viz.*

1. Aries,

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1. Aries, or ram and ſheep, the horns of which are ſhaped like a half-moon, and compreſſed. This animal is perhaps the moſt gentle and inoffenſive, and at the ſame time the moſt timid and ſtupid, of all quadrupeds. In a flock of ſheep, there is always a leader, whoſe ſteps the reſt implicitly and blindly follow. If he runs over a precipice, the whole flock follow his example, and cannot be reſtrained though evident deſtruction be the conſequence. The ſmalleſt noiſe, if uncommon, makes them run precipitantly againſt each other, without knowing the cauſe of their danger, or being able to extricate themſelves. In ſnow, they remain fixed in the ſame ſpot; and continue obſtinately in that ſituation, unleſs they are forced to move by the ſhepherd or his dog. But though daſtardly in itſelf, though almoſt devoid of ſentiment and mental qualities, this animal is of the moſt extenſive utility to man. It affords us both food and cloathing, beſides the advantages we derive from its milk, its ſkin, and its tallow.

Love, the livelieſt ſentiment in all animals, is the only paſſion which inſpires the ram with any degree of vivacity; when under the influence of this paſſion, he becomes petulant, runs againſt his neighbours, and ſometimes even attacks the ſhepherd himſelf. But the ewe, or female, though in the ſame ſituation, does not appear to be in the leaſt affected; ſhe ſeems to have no other inſtinct than that of ſimply admitting the embraces of the ram, eating her food, and recogniſing her offſpring; the lamb, on the other hand, is endowed with the ſame inſtinct of diſtinguiſhing its mother from the reſt of the flock.

This animal, ſo ſoft and ſo ſimple in its nature and diſpoſition, is likewiſe extremely weak and feeble in its conſtitution: They can endure but little fatigue; whenever they run, their hearts palpitate, and their wind fails them; they are equally incapable of bearing heat or cold, ſnow or rain: They are ſubject to many diſeaſes, moſt of which are contagious: They bring forth their young with pain and difficulty, and require more care and attention than any other domeſtic animal.

The ram is capable of generation at the age of 18 months; and the ewe can be impregnated when a year old. One ram is ſufficient for 30 or 40 ewes. He ought to be ſtrong, well proportioned; his head ſhould be thick and ſtrong, his front large, his eyes black, his noſe flat, his neck thick, his body long and tall, his teſticles maſſy, and his tail long. White is the beſt colour for a ram. The ewes whoſe wool is moſt plentiful, buſhy, long, ſoft, and white, are moſt proper for breeders, eſpecially when at the ſame time they are of a large ſize, have a thick neck, and move nimbly.

Ewes are generally in ſeaſon from the end of October to the beginning of April: However, they may be impregnated at any time, if they be fed with ſtimulating nouriſhment, as ſalt water, and bread made of hemp-ſeed. They go with young about five months, and generally bring forth but one at a time, though frequently two: In warm climates, they may bring forth twice in a year; but in Britain, France, and moſt parts of Europe, only once. They give milk plentifully for ſeven or eight months: Their milk affords nouriſhment for children and country people; good cheeſe is made of it, eſpecially when mixed with cow-milk. They live from 10 to 12 years, and are capable of bringing forth as long as they live.

When the male lambs are not intended to be kept for propagation, but fattened for food, they ought to be caſtrated at the age of five or ſix months. This operation is performed two ways: in the one, an inciſion is made and the teſticles taken out; in the other, a ligature is tied tight round the ſcrotum, above the teſticles, which ſoon deſtroys the veſſels which nouriſh them. After caſtration, they are called weathers.

The ram, ewe, and weather, when one year old, loſe the two foreteeth of the under jaw; ſix months afterwards, they loſe the two foreteeth next to theſe; and at the age of three years, the teeth are all replaced. The age of a ram may likewiſe be diſcovered by their horns, which always appear the firſt year, and frequently as ſoon as they are brought forth. Theſe horns uniformly acquire an additional ring every year as long as the creature lives. The ewes commonly have no horns, but a kind of long protuberances in place of them: However, ſome of them have two, and ſome four horns.

In Spain, and the ſouthern parts of Europe, the flocks are kept in ſhades or ſtables during the night: but in Britain, where there is now no danger from wolves, they are allowed to remain without, both night and day; which makes the animals more healthy, and their fleſh a more whole food. Dry and mountainous grounds, where thyme and ſheep's feſcue graſs abound, are the beſt for the paſturing ſheep.

2. The Guineenſis, or Guinea ſheep, has pendulous ears, lax hairy dew laps, and a prominence on the hind part of the head. The wool is ſhort, like that of a goat. It is a native of Guinea.

3. The ſtrepſiceros, or Cretan ſheep, has ſtrait carinated horns, twiſted in a ſpiral manner. It is a native of Mount Iola.

OULNEY, a market-town of Buckinghamſhire, ſituated nine miles ſouth-eaſt of Northampton.

OULZ, a town of Italy, in the province of Piedmont, ſituated in E. long. 6° 30°, N. lat. 45°.

OUNCE, a little weight, the ſixteenth part of a pound avoirdupois, and the twelfth part of a pound troy.

OUNCE. in zoology. See LEO.

OUNDLE, a market-town of Northamptonſhire, ſituated on the river Nen, twenty-two miles north-eaſt of Northampton.

OVOLO, or OVUM. in architecture, a round moulding, whoſe profile, or ſweep, in the ionic and compoſite capitals, is uſually a quadrant of a circle: whence it is alſo commonly called the quarter-round.

It is uſually cut with the repreſentation of eggs and anchors or arrows heads placed alternately.

OUSE, a river, which, riſing in the north of Yorkſhire, runs ſouth-eaſt by York; and, continuing that courſe, falls into the Trent.

OUSE, is alſo a river which riſes on the confines of Oxfordſhire and Buckinghamſhire; and running north eaſt through Buckinghamſhire, Bedfordſhire, Huntingdonſhire, Cambridgeſhire, and Norfolk, paſſes by Buckingham, Bedford, Huntington, and Ely, diſcharging itſelf into the bay of the German ſea at Lynn.

OUSTIACH, or OSTIACH *Country*, is a part of Aſiatic Ruſſia, extending along the river Irtis to its confluence with the river Oby, and from thence northward along the banks of the Oby and Jeniſa, into the gulph of the Mingaſea, or the frozen ocean; and extending alſo along

the banks of ſeveral rivers which fall into the Oby and Jeniſa.

OUTLAW, ſignifies one that is deprived of the benefit of the law, and therefore held to be out of the king's protection. See the next article.

OUTLAWRY, is where a perſon is outlawed, and on that account loſes the benefit of a ſubject,

The proceſs of outlawry lies in indictments of treaſon or felony, and alſo of treſpaſs vi & armis, conſpiracy, *&c.* And by ſtatute, perſons may be outlawed in many civil actions, as debt, caſe, covenant, *&c.*

OUTWORKS, in fortification, all thoſe works made without ſide the ditch of a fortified place, to cover and defend it. See FORTIFICATION.

OUZEL, in ornithology. See MOTACILLA.

OWL, in ornithology. See STRIX.

OX, in zoology. See BOS.

OXALIS, in botany, a genus of the decandria pentagynia claſs. The calix conſiſts of five leaves; the petals are connected by the claws; and the capſule has five ſides. There are 14 ſpecies, only one of them, *viz.* the acetoſella, or wood ſorrel, is a native of Britain.

OXFORD, the capital of Oxfordſhire, and the ſee of a biſhop; it is ſituated at the confluence of the Iſis and Cherwell, fifty-five miles weſt of London: W. long. 1° 15′, and N. lat. 51° 45′.

Oxford is moſt remarkable on account of its univerſity, which conſiſts of twenty colleges and five halls: this city ſends two members to parliament, and the univerſity as many.

OXGANG, or OXGATE, is generally taken, in our old law-books, for fifteen acres, or as much ground as a ſingle ox can plough in a year.

OXUCLÆ, in natural hiſtory, the name of a genus of foſſils of the claſs of the ſelenitæ, but of the columnar, not the rhomboidal kind.

Of this genus there are only two known ſpecies. 1. A fine kind, with thin flakes and tranſverſe filaments, found in the clayey banks of the river Nen, near Peterborough, in Northamptonſhire; and, 2. A dull kind, with thick plates and longitudinal filaments. This is not uncommon in Yorkſhire, and lies ſometimes in a yellow, ſometimes in a blue clay.

OXUS, a river which riſes in the mountains on the north of India; and running north-weſt, through Uſbec Tartary, afterwards ſeparates Perſia from Uſbec Tartary, and falls into the Caſpian ſea, in 44° N. lat.

OXYCOCCUS, in botany. See VACCINIUM.

OXYCRATE, in pharmacy, *&c.* a mixture of vinegar and water, proper to aſſwage, cool, and refreſh: they make fomentations of oxycrate, clyſters of oxycrate, *&c.* The uſual proportion is one ſpoonful of vinegar to five or ſix ſpoonfuls of water.

OXYCROCEUM, in pharmacy, *&c.* a preparation much uſed in plaſters for fractures, *&c.* made as follows: Take yellow wax, one pound; pitch and galbanum, each half a pound: melt them over a gentle fire; and then add of venice-turpentine, myrrh, and olibanum, each three ounces; ſaffron, two ounces: make them into a plaſter.

OXYGLYCU, a ſpecies of drink prepared of the ſweeteſt honey combs, macerated and boiled. The combs from which all the honey has been expreſſed, are put into a pot with pure water, and boiled till they ſeem to have depoſited all their contained honey in the water. This liquor is to be kept, and, when diluted with cold water, is to be drank in the ſummer-time, in order to remove thirſt.

OXYMEL, in pharmacy, a compoſition of vinegar and honey.

There are ſeveral ſorts of oxymel, whereof the ſimple kind is made by boiling, in a glazed earthern veſſel, and with a gentle fire, two pounds of clarified honey, in a pint of vinegar, to the conſiſtence of a ſyrup.

OYER, in law-books, ſeems to have been anciently uſed for what is now called aſſiſes.

OYER AND TERMINER, a commiſſion directed to the judge of aſſiſe, and other gentlemen, impowering them to hear and determine all criminal cauſes, and to try all offenders, whether for treaſon, felony, or treſpaſs.

OYES, or OYEZ, ſignifies *Hear ye*; and is frequently uſed by the criers in our courts, on making proclamations, or to enjoin ſilence.

OYSTER, in zoology. See OSTREA.

OZÆNA, a foul and malignant ulcer of the noſe, diſtinguiſhed by its fœtor, and often accompanied with a caries of the bones of the noſe.

P.

P A C

PABULUM. See FUEL and FIRE.

PACA, in zoology. See MUS.

PACE, a meaſure taken from the ſpace between the two feet of a man, in walking; uſually reckoned two feet and a half, and in ſome men a yard or three feet.

The geometrical pace is five feet; and 60000 ſuch paces make one degree of the equator.

PACE, in the manege, is of three kinds, *viz.* walk, trot, and gallop; to which may be added an amble, becauſe ſome horſes have it naturally.

P A C

Horſes which go ſhuffling or mixed paces, between the walk and amble, are for the moſt part of no value; which commonly proceeds from their fiery temper, and ſometimes from a weakneſs in their reins or legs.

PACHAMAC, a temple of Peru, in South America, dedicated by the Indians to the ſupreme being: it gives its name to the adjacent country.

PACHODECARHOMBIS, in natural hiſtory, the name of a genus of foſſils, of the claſs of the ſelenitæ, expreſſing a thick rhomboidal body, compoſed of ten planes.

PACIFIC

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PACIFIC OCEAN, that vaſt ocean which ſeparates Aſia from America: it is called Pacific, from the moderate weather the firſt mariners who ſailed in it met with between the tropics; and it was called ſouth-ſea, becauſe the Spaniards croſſed the iſthmus of Darien from north to ſouth, when they firſt diſcovered it: though it is properly the Weſtern ocean, with regard to America.

PACK, in commerce, denotes a quantity of goods, made up in loads, or bales, for carriage.

A pack of wool is ſeventeen ſtone and two pounds, or a horſe's load.

PACKAGE, is a ſmall duty of one penny in the pound, paid for all goods not particularly rated.

PACOS, in zoology. See CAMELUS.

PACTOLUS, a river of Lydia in the leſſer Aſia, celebrated by the ancient poets for its golden ſands.

PADDOC, or PADDOC-COURSE, a piece of ground encompaſſed with pales or a wall, and taken out of a park for exhibiting races with grey-hounds, for plates, wagers, or the like.

PADERBORNE, the capital of the biſhopric of the ſame name in Weſtphalia: E. long. 8° 25′, N. lat. 51° 45′.

PADSTOW, a market town of Cornwall, thirty miles weſt of Launceſton.

PADUA, the capital of the Paduan, in Italy, a city of a circular form, ſituated twenty-two miles weſt of Venice: E. long. 12° 15′, N. lat. 45° 30′.

PADUAN, a province of Italy, in the territories of Venice, thirty-five miles long, and almoſt as much in breadth; bounded by the Treviſane on the north, by the duchy of Venice on the eaſt, by the Poleſin de Rovigo on the ſouth, and by the Vicentin on the weſt.

PADUAN, among the medaliſts, a modern medal ſtruck in imitation of the antique; or a new medal ſtruck with all the marks and characters of antiquity.

PADUS, in botany. See PRUNUS.

PÆAN, among the ancient pagans, was a ſong of rejoicing ſung in honour of Apollo, chiefly uſed on occaſions of victory and triumph.

PÆAN, in the ancient poetry, a foot conſiſting of four ſyllables; of which there are four kinds, the pæan primus, ſecundus, &c.

The pæan primus conſiſts of one long ſyllable and three ſhort ones, or a trochæus and pyrrhichius, as *temporibus*; the pæan ſecundus conſiſts of a ſhort ſyllable, a long, and two ſhort, or an iambus and a pyrrhichius, as *potentia*; the pæan tertius conſiſts of two ſhort ſyllables, a long and a ſhort one, or a pyrrhichius and a trochæus, as *animatus*; the pæan quartus conſiſts of three ſhort ſyllables and a long one, or a pyrrhichius and iambus, as *celeritas*.

PÆDEROTA, in botany, a genus of the diandria monogynia claſs, of which there are two ſpecies, none of them natives of Britain.

PÆDO-BAPTISM, infant-baptiſm, or that conferred on children.

PÆONIA, in botany, a genus of the polyandria digynia claſs. The calix conſiſts of five leaves, and the corolla of five petals; the ſtylus is wanting; and the capſule contains many ſeeds. There are two ſpecies, none of them natives of Britain.

The root of this plant is a very celebrated medicine in nervous caſes.

PAGAN, a heathen, gentile, or idolater; one who adores falſe gods. See MYTHOLOGY.

PAGANALIA, certain feſtivals obſerved by the ancient Romans in the month of January. They were inſtituted by Servius Tullius, who appointed a certain number of villages (pagi), in each of which an altar was to be raiſed for annual ſacrifices to their tutelar gods; at which all the inhabitants were to aſſiſt, and give preſents in money, according to their ſex and age, by which means the number of country-people was known. The ſervants upon this occaſion offered cakes to Ceres and Tellus, to obtain plentiful harveſts.

PAGANELLUS, in ichthyology. See GOBIUS.

PAGANISM, the religious worſhip and diſcipline of pagans; or, the adoration of idols and falſe gods. See IDOLATRY and MYTHOLOGY.

PAGEANT, a triumphal car, chariot, arch, or other like pompous decoration, variouſly adorned with colours, flags, &c. carried about in public ſhews, proceſſions, &c.

PAGOD, or PAGODA, a name whereby the Eaſt-Indians call the temple in which they worſhip their gods.

PAGOD, or PAGODA, is alſo the name of a gold and ſilver coin, current in ſeveral parts of the Eaſt-Indies.

PAIN, is defined to be an uneaſy ſenſation ariſing from a ſudden and violent ſolution of the continuity, or ſome other accident in the nerves, membranes, veſſels, muſcles, &c. of the body; or, according to ſome, it conſiſts in a motion of the organs of ſenſe; and, according to others, it is an emotion of the ſoul occaſioned by theſe organs.

PAINTING, the art of repreſenting natural bodies, and giving them an appearance of life, by the turn of lines, and the degrees of colours.

Whoever would apply himſelf to painting, ſays Leonardo da Vinci, muſt in the firſt place learn perſpective: this will enable him to diſpoſe things in their proper places, and to give the due dimenſions to each: having done this, he muſt learn to deſign; chuſing for that purpoſe ſome able maſter, who at the ſame time may give him ſome inſight into the colours of figures: he ought then to conſult nature, to confirm himſelf in what he has already learnt; and, laſtly, let him apply himſelf to the ſtudy and imitation of the greateſt maſters, in order to get a habit of reducing what he has learnt into practice.

To judge of the goodneſs of a painting, it is neceſſary to eſtabliſh to ourſelves a ſyſtem of rules to be applied occaſionally; and to aſſiſt the judgment herein, the following rules have been laid down: 1. The ſubject muſt be finely imagined, and, if poſſible, improved in the painter's hands; he muſt think well as an hiſtorian, poet, philoſopher, or divine, and more eſpecially as a painter, in making a wiſe uſe of all the advantages of his art, and in finding expedients to ſupply its defects. 2. The expreſſion muſt be proper to the ſubject, and the characters of the perſons: it muſt be ſtrong, ſo that the dumb ſhew may be perfectly and readily underſtood: every part of the picture muſt contribute to this end; colours, animals, draperies, and eſpecially the actions of the figures, and above all the airs of the heads. 3. There muſt be one principal light; and this, and all the ſubordinate ones, with the ſhadows and repoſes, muſt make one entire and harmonious maſs; the ſeveral parts muſt be well connected and contraſted, ſo as to render the whole as grate-

ful

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ſal to the eye, as a good piece of muſick to the ear. By this means the picture is not only more delightful, but better ſeen and comprehended. 4. The drawing muſt be juſt; nothing muſt be flat, lame, or ill proportioned; and theſe proportions ſhould vary according to the characters of the perſons drawn. 5. The colouring, whether gay or ſolid, muſt be natural, beautiful, and clean, and what the eye is delighted with, in ſhadows, as well as lights and middle tints; and whether the colours are laid on thick, or finely wrought, they muſt appear to be done by a light and accurate hand. Laſtly, Nature muſt be the foundation that muſt be ſeen at the bottom; but nature muſt be raiſed and improved, not only from what is commonly ſeen, to what is but rarely met with, but even yet higher, from a judicious and beautiful idea in the painter's mind, ſo that grace and greatneſs may ſhine throughout more or leſs according to the ſubject.

Painting is of various kinds, according to the materials uſed, the matter upon which they are applied, and the manner of applying them; as painting in oil, in water-colours, freſco, *&c.*

PAINTING *in oil.* The whole ſecret of painting in oil conſiſts in grinding the colours with nut oil, or linſeed-oil; but the manner of working is very different from that in freſco, or in water, by reaſon the oil does not dry near ſo faſt, which gives the painter an opportunity of touching and re touching all the parts of his figures as often as he pleaſes; which in the other methods of painting is a thing impracticable. The figures done in oil are alſo capable of more force and boldneſs; inſomuch that the black becomes blacker, when ground with oil, than with water; beſides, all the colours mixing better together, makes the colouring the ſweeter, more delicate and agreeable, and gives an union and tenderneſs to the whole, inimitable in any of the other manners.

Painting in oil is performed on canvas, on walls, wood, ſtone, and all ſorts of metals. 1. Painting on cloth or canvas is done as follows: The canvas being ſtretched on a frame, give it a layer of ſize, or paſte-water, and then go over it with a pumice-ſtone to ſmooth off the knots. By means of the ſize, the little threads and hairs are all laid cloſe on the cloth, and the little holes filled up, ſo that no colour can paſs through. When the cloth is dry, lay on oker in oil, which may be mixed with white-lead to make it dry the ſooner. When dry, go over it again with the pumice-ſtone, to make it ſmooth. After this a ſecond couch is ſometimes applied, compoſed of white-lead and a little charcoal-black, to render the ground of an aſh colour. Others prime the canvas in the following manner: They firſt ſmooth the canvas with a pumice-ſtone, ſize it over with a good ſize and a little honey, and let it ſtand to dry; after which they lay it over with whiting and ſize, mixed with a little honey: the uſe of the honey is to prevent it from cracking, peeling, and breaking out; on this they firſt draw the picture with a coal, and then lay on the colours. 2. Painting on walls: When the wall is dry, they give it two or three waſhes with boiling oil; till the plaſter remains quite greaſy, and will imbibe no more; upon this they lay drying colours, ſuch as white-chalk, red-oker, or other chalks beaten pretty ſtiff. When this couch or layer is well dried, the ſubject or deſign is ſketched out, and afterwards painted over, mixing a little varniſh with their colours, to ſave the varniſhing afterwards. In order the better to fortify the wall againſt moiſture, ſome cover it with a plaſter of lime, marble-duſt, or a cement made of beaten tiles ſoaked in linſeed-oil; and at laſt prepare a compoſition of green-pitch, maſtic, and thick varniſh boiled together, which they apply hot over the former plaſter; and when dry, lay on the colours as before. Others, in fine, make their plaſter with lime-mortar, tile-cement, and ſand; and this being dry, they apply another of lime, cement, and iron-ſcoriæ; which being well beaten, and incorporated with linſeed-oil and whites of eggs, makes an excellent plaſter. When this is dry, the colours are laid on as before. 3. In painting on wood, they uſually give their ground a couch or layer of white tempered with ſize, and then proceed as in painting on walls. 4. In painting on ſtone or metals, it is not neceſſary to lay them over with ſize, but only to add a ſlight couch of colours before the deſign is drawn on it; nor even is this done on ſtones, where you would have the ground appear, as in certain marbles and agates of extraordinary colours.

All the colours uſed in freſco are good in oil, except white of lime and marble duſt. Thoſe chiefly uſed are white-lead, or ceruſe, yellow and white maſticot, orpiment, vermilion, lacca, blue and green aſhes, verdigreaſe, indigo, ſmalt, black-lead, ivory-black, lamp-black, *&c.* As to oils, the beſt are thoſe of linſeed, walnuts, ſpike, and turpentine. The drying oils are nut-oil, boiled with litharge and ſandarach, and otherwiſe with ſpirit of wine, maſtic, and gum-lacca.

In the preparation of oil-colours, care muſt be taken that they be ground fine; that in putting them on a pallet, thoſe which will not dry of themſelves be mixed with drying oil, or other ingredients of a dying quality; and that the tinged colours be mixed in as ſmall quantities as poſſible. As to the ſituation of the colours, the pureſt and ſtrongeſt muſt be placed in the front of the piece, and the colouring varied according to the ſubject, time, and place. If the ſubject be grave, melancholy, or terrible, the general tint of the colouring muſt incline to brown and black, or red and gloomy; but it muſt be gay and pleaſant, in ſubjects of joy and triumph.

PALÆSTRA, in Grecian antiquity, a public building, where the youth exerciſed themſelves in wreſtling, running, playing at quoits, *&c.*

PALÆSTROPHYLAX, was the director of the palæſtra and the exerciſes performed there.

St. PALAIS, a town of France, in the province of Gaſcony, capital of the lower Navarre, ſituated in W. long. 1° 8′, N. lat. 43° 23′.

PALAMBOANG, or PALAMBANG, the capital of a kingdom at the eaſt end of the iſland of Java, in the Eaſt-Indies, ſituated on the ſtraits of Bally, in E. long. 114°, S. lat. 7° 30′, and ſeparated from the iſland of Bally by a narrow ſtrait.

PALAMEDIA, in ornithology, a genus beloging to the order of grallæ. The bill is conical, the ſuperior mandible being crooked; and the feet have three divided toes. There are two ſpecies, both natives of Braſil.

PALARIA, among the Romans, a kind of exerciſe, performed at a ſtake by the ſoldiers. The ſtake being fixed in the ground, and ſix feet high above it, the young undiſciplined ſoldiers advanced againſt it, armed with a hurdle and cudgel, inſtead of a ſhield and ſword, and went through all the rules of attack and defence, as if actually engaged

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engaged with an adverſary. Sometimes they ſtood at a diſtance, and attacked with miſſive weapons, at the ſame time uſing all the requiſite motions for defending themſelves, and warding off what might be thrown againſt them.

PALATE, in anatomy. See ANATOMY, p. 162, 303.

PALATINATE, a province, or ſignory, poſſeſſed by a palatine.

PALATINE, or COUNT PALATINE, a title anciently given to all perſons who had any office or employment in the prince's palace; but afterwards conferred on thoſe delegated by princes to hold courts of juſtice in the provinces; and on ſuch among the lords as had a palace, that is, a court of juſtice, in their own houſes.

At preſent the word palatine is reſtrained to a prince of Germany, or a lord of Poland, poſſeſſed of a palatine.

PALATO-SALPINGÆUS. See ANATOMY, p. 303.

PALATO-STAPHYLINUS, in anatomy. See ANATOMY, p. 303.

PALE, a little pointed ſtake or piece of wood, uſed in making incloſures, ſeparations, *&c.* The pale was an inſtrument of puniſhment and execution among the ancient Romans, and ſtill continues ſo among the Turks. Hence empaling, the paſſing a ſharp pale up the fundament through the body.

PALE, in heraldry, one of the honourable ordinaries of an eſcutcheon; being the repreſentation of a pale or ſtake placed upright, and comprehending the whole height of the coat from the top of the chief to the point. When the pale is ſingle, it is to contain one third of the breadth of the ſhield. See Plate CXXXIV. fig. 7.

PALERMO, the capital of the iſland of Sicily, ſituated on the north coaſt of that iſland, on a bay of the Mediterranean ſea: E. long. 13°, N. lat. 38° 30'.

PALESTINE, a part of Aſiatic Turky, ſituated between thirty-ſix and thirty-eight degrees of eaſt longitude, and between thirty-one and thirty-four degrees of north latitude: it is bounded by Mount Libanus, which divides it from Syria, on the north; by Mount Hermon, which ſeparates it from Arabia Deſerta, on the eaſt; by the mountains of Seir and the Deſarts of Arabia Petræa, on the ſouth; and by the Mediterranean ſea, on the weſt.

It was called Paleſtine, from the Philiſtines who inhabited the ſea-coaſts. It was alſo called Judea, from Judah; and the Holy Land, from our Saviour's reſidence and ſufferings in it; and it is called Canaan, and the Promiſed Land, in the ſcriptures.

It is 150 miles in length, and 80 in breadth; and in the time of Solomon it ſeems to have extended from the Mediterranean ſea to the river Euphrates.

PALESTRINA, a city of Italy, in the pope's territory and Campania of Rome, ſituated thirty miles eaſt of Rome.

PALIMBAM, a town on the iſland of Sumatra, in the Eaſt-Indies, ſituated in E. long. 103°, S. lat. 3°.

PALINDROMUS, a verſe or ſentence which runs the ſame when read either backwards or forwards; ſuch is the verſe,

Roma tibi ſubito motibus ibit amor.

PALING, a ſort of fencing for fruit-trees planted in fields, wherein three ſmall poſts are erected at a foot and a half diſtance one from another, and near the top nailed to each other with croſs-bars.

PALINGENESIA, among divines, ſignifies the ſame with regeneration.

Among chemiſts, it denotes the producing a body from its principles.

PALINODY, a diſcourſe contrary to a preceding one: hence the phraſe *palinodiam canere* was taken for a recantation.

PALISADE, in fortification, an incloſure of ſtakes or piles driven into the ground, each ſix or ſeven inches ſquare, and eight feet long, three whereof are hid under ground.

PALISSE', in heraldry, a bearing like a range of paliſades before a fortification, repreſented on a feſſe, riſing up a conſiderable height, and pointed a-top, with the field appearing between them. See Plate CXXXIV. fig. 8.

PALIURUS, in botany. See RHAMNUS.

PALL, in heraldry, denotes a kind of croſs repreſenting the pallium, or archiepiſcopal ornament ſent from Rome to the Metropolitans. See Plate CXXXIV. fig. 9.

PALLA, in Roman antiquity, a mantle which women wore over the gown called ſtola. It was borne on the left ſhoulder; whence paſſing to the other ſide, under the right arm, the two ends were bound under the left arm, leaving the breaſt and arm quite bare.

PALLADIUM, in antiquity, a ſtatue of the goddeſs Pallas, ſuppoſed to have dropped down from heaven, preſerved in Troy, whereon the fate of that city is ſaid to have depended.

PALLET, among painters, a little oval table, or piece of wood, or ivory, very thin and ſmooth; on and round which the painters place the ſeveral colours they have occaſion for, to be ready for the pencil. The middle ſerves to mix the colours on, and to make the tints required in the work. It has no handle, but inſtead thereof, a hole at one end to put the thumb through to hold it.

PALLET, in heraldry, is nothing but a ſmall pale, conſiſting of one half of it in breadth, and therefore there are ſometimes ſeveral of them upon one ſhield.

PALLET, in ſhip-building, is a room within the hold, cloſely parted from it, in which by laying ſome pigs of lead, *&c.* a ſhip may be ſufficiently ballaſted, without loſing room in the hold; which, therefore, will ſerve for the ſtowing the more goods.

PALLIATION, or a PALLIATIVE CURE, in medicine, is when, in deſperate and incurable diſeaſes, after predicting the fatal event, the phyſician preſcribes ſome remedies for mitigating the pain or ſome other urgent ſymptoms, as in ulcerated cancers, or cancerous fiſtulas, and the like.

PALLIUM, or PALL, an archiepiſcopal veſtment, of white woollen cloth, about the breadth of a border, made round, and thrown over the ſhoulders.

PALM-SUNDAY, in the Chriſtian church, the Sunday next before Eaſter; being ſo called in memory of our Saviour's triumphal entry into Jeruſalem, when the multitude that attended him ſtrewed palm-branches in his way.

PALM-TREE, in botany. See PHOENIX.

PALMA ISLE, one of the Canary-iſlands, ſixty miles north-weſt of Teneriff.

PALMARIS, in anatomy. See ANATOMY p. 199.

PALMATED, ſomething reſembling the ſhape of the hand: thus we ſay palmated leaves, roots, ſtones, *&c.*

PALMIPEDES, among ornithologiſts, the ſame with web-footed birds.

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PALMISTRY, a kind of divination, or rather a deceitful art practiſed by gypſies, who pretend to foretel events by looking upon the lines and marks of the hand.

PALMYRA, the ruins of a magnificent city, in the province of Syria, two hundred miles ſouth-eaſt of Aleppo.

PALOS, a port-town of Spain, ſituated on the bay of Cadiz: W. long. 7° 15′, N. lat. 37°.

PALPABLE, ſomething perceiveable by the ſenſes, particularly that of feeling.

PALPITATION, a ſpaſtic contraction of the heart, when it leaps and beats violently.

PALSY, in medicine. See MEDICINE, p. 97.

PALUDAMENTUM, in Roman antiquity, a habit that differed in little from the chlamys, except that this laſt belonged chiefly to the lower claſs of people. See CHLAMYS.

PALUMBUS. See COLUMBA.

PALY, or PALE′, in heraldry, is when the ſhield is divided into four or more equal parts, by perpendicular lines falling from the top to the bottom. See Plate CXXXIV. fig. 1c.

Paly bendy is when the eſcutcheon is divided by perpendicular lines, which is paly; and alſo by diagonals, which is called bendy. See the article BENDY.

PAMPELUNA, the capital of Spaniſh Navarre, is the ſee of a biſhop, and an univerſity: W. long. 1° 30′, N. lat. 43° 15′.

PANACEA, among phyſicians, denotes an univerſal medicine, or a remedy for all diſeaſes; a thing impoſſible to be obtained.

PANADA, a diet conſiſting of bread boiled in water to the conſiſtence of a pulp, and ſweetened with a little ſugar.

PANAMA, the capital city of the province of Darien, in South America, where the treaſures of gold and ſilver, and the other rich merchandize of Peru, are lodged in magazines till they are ſent to Europe: W. long. 82°, N. lat. 9°.

PANARO, a river of Italy, which riſing in the Appenine mountains, on the confines of Tuſcany, divides Modena from Romania, and then running through the Ferrareſe falls into the Gulph of Venice.

PANATHENÆA, in Grecian antiquity, an ancient Athenian feſtival, in honour of Minerva, who was the protectreſs of Athens, and called Athena.

PANAX, in botany, a genus of the polygamia dioecia claſs. The calix of the hermaphrodite has five teeth, and the corolla five petals; there are five ſtamina, and two ſtyli; and the berry contains two ſeeds. The calix of the male is entire; the corolla has five petals; and there are five ſtamina. The ſpecies are three, none of them natives of Britain.

PANAY, the capital of the iſle of Panay, one of the Philippine iſlands: E. long. 119°, and N. lat. 11°.

PANCARPUS, in Roman antiquity, a kind of ſhew which the Roman emperors frequently exhibited to the people. In this ſpectacle, the circus being ſet all over with large trees, repreſented a foreſt, into which the beaſts being let from the dens under the ground, the people, at a ſign given by the emperor, purſued, ſhot, cut in pieces, and killed all they could lay hold of, which they afterwards carried away, to regale upon at home. The beaſts uſually given on theſe occaſions were boars, deer, oxen, and ſheep.

PANCHYMAGOGUE, in pharmacy, a name given to ſome cathartic extracts.

PANCRATIUM, among the ancients, a kind of exerciſe, which conſiſted of wreſtling and boxing. In theſe conteſts it was cuſtomary for the weaker party, when he found himſelf preſſed by his adverſary, to fall down, and fight rolling on the ground.

PANCRATIUM, in botany, a genus of the hexandria monogynia claſs. It has ſix petals, and a nectarium divided into twelve ſegments, and the ſtamina lie upon the nectarium. There are ſeven ſpecies, none of them natives of Britain.

PANCREAS, in anatomy. See ANATOMY, p. 265.

PANDECTS, in the civil law, collections made by Juſtinian's order, of five hundred and thirty-four deciſions of the ancient lawyers, on ſo many queſtions occurring in the civil law; to which that emperor gave the force and authority of law, by an epiſtle prefixed to them. The pandects conſiſt of fifty books, and make the firſt part of the body of the civil law.

PANDICULATION, a ſtretching, or that violent and tenſive motion of the ſolids, which uſually accompanies the act of yawning.

PANEGYRIC, an oration in praiſe of ſome extraordinary thing, perſon, or virtue.

Panegyrics were anciently made in the public and ſolemn aſſemblies of the Greeks, either at their games, their feaſts, or religious meetings.

PANEGYRICUM, in church-hiſtory, an eccleſiaſtical book, uſed by the Greek church, containing the panegyrical orations of various authors on the ſolemnities of Jeſus Chriſt and the ſaints.

PANGONIA, in natural hiſtory, the name of a genus of cryſtal, conſiſting of ſuch as are compoſed of many angles.

PANIC, denotes an ill-grounded terror or fright.

PANICLE, in botany, denotes a ſoft woolly beard, on which the ſeeds of ſome plants, as millet, reeds, *&c.* hang.

PANICUM, in botany, a genus of the triandria digynia claſs. The calix conſiſts of three valves, the inmoſt of which is leaſt. There are 28 ſpecies, four of which are natives of Britain, *viz.* the viride, or green panic-graſs; the cruſſgalli, or looſe panic-graſs; the ſanguinale, or cock's-foot panic-graſs; and the dactylon, or creeping panic-graſs.

PANNEL, in law, ſignifies the priſoner at the bar, or perſon who takes his trial before the court of juſticiary, for ſome crime. See LAW, Tit. xxxiii. 47.

PANNELS *of a ſaddle*, are two cuſhions or bolſters, filled with cow's, deer's, or horſe-hair, and placed under the ſaddle, on each ſide, to prevent the bows and bands from galling the horſe.

PANNICULUS CARNOSUS, in comparative anatomy, a robuſt fleſhy tunic, ſituated in beaſts, between the tunic and the fat; by means of which they can move their ſkin in whole or part: it is altogether wanting in mankind.

PANORPA, the SCORPION-FLY, in zoology, a genus of inſects belonging to the order of neuroptera. The roſtrum is horny and cylindrical; there are two pappi, and three ſtemonata; the feelers are longer than the thorax; and the tail of the male is furniſhed with a forceps. There are four ſpecies, diſtinguiſhed by the colour and ſhape of their wings.

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PANTALOON, a ſort of garment, conſiſting of breeches and ſtockings all of one piece; ſaid to have been firſt introduced by the Venetians.

PANTHEON, in Roman antiquity, a temple of a circular form, dedicated to all the gods: It was built by Agrippa, ſon-in-law to Auguſtus; but is now converted into a church, and dedicated to the Virgin and all the martyrs.

PANTHER, in zoology. See LEO.

PANTOMIME, a perſon who imitates all ſorts of actions and characters, by mere geſtures, without ſpeaking a word.

PANUCO, a city of Mexico, ſituated at the mouth of a river of the ſame name, and which falls into the gulph of Mexico: W long. 103°, and N lat. 23°.

PAPAVER, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of four petals, and the calix of two leaves. There are nine ſpecies, ſix of them natives of Britain, *viz.* the hybridum, or round rough-headed poppy; the cambricum, or yellow poppy; the ſomniferum, or wild poppy; the orgemone, or long rough-headed poppy; the rhœas, or red corn-poppy; and the dubium, or long ſmooth-headed poppy. For the medical properties of poppy, ſee OPIUM.

PAPENHEIM, a town of Franconia, in Germany, ſubject to its own count: E. long. 11°, N. lat. 48° 55′.

PAPER, ſheets of a thin matter, made of ſome vegetable ſubſtance.

The materials on which mankind have, in different ages, contrived to write their ſentiments, have been extremely various; in the early ages they made uſe of ſtones, and tables of wood, wax, ivory, *&c.* See BOOK.

Paper, with regard to the manner of making it, and the materials employed therein, is reducible to ſeveral kinds; as Egyptian paper, made of the ruſh papyrus; bark-paper, made of the inner rind of ſeveral trees; cotton paper; incombuſtable paper; and European paper, made of linen-rags.

Egyptian paper was principally uſed among the ancients; being made of the papyrus, or biblus, a ſpecies of ruſh which grew on the banks of the Nile. In making it into paper, they began with lopping off the two extremes of the plant, the head and the root; the remaining part, which was the ſtem, they cut lengthwiſe into two nearly equal parts, and from each of theſe they ſtripped the ſcaly pellicles of which it conſiſted. The innermoſt of theſe pellicles were looked on as the beſt, and that neareſt the rind as the worſt: they were therefore kept apart, and made to conſtitute two different ſorts of paper. As the pellicles were taken off, they extended them on a table, laying them over each other tranſverſely, ſo as that the fibres made right angles: in this ſtate they were glued together by the muddy waters of the Nile; or, when thoſe were not to be had, with paſte made of the fineſt wheat-flour, mixed with hot water and a ſprinkling of vinegar. The pellicles were next preſſed to get out the water, then dried, and laſtly flatted and ſmoothed by beating them with a mallet: this was the Egyptian paper, which was ſometimes farther poliſhed by rubbing it with a glaſs-ball, or the like.

Bark-paper was only the inner whitiſh rind, incloſed between the bark and the wood of ſeveral trees, as the maple, plane, beech, and elm, but eſpecially the tilia, or linden-tree, which was that moſtly uſed for this purpoſe. On this ſtripped off, flatted, and dried, the ancients wrote books, ſeveral of which are ſaid to be ſtill extant.

Chineſe paper is of various kinds. Some is made of the rinds or barks of trees, eſpecially the mulberry-tree and elm, but chiefly of the bambu and cotton tree. In fact, almoſt each province has its ſeveral paper. The preparations of paper made of the barks of trees, may be inſtanced in that of the bambu, which is a tree of the cane or reed kind. The ſecond ſkin of the bark, which is ſoft and white, is ordinarily made uſe of for paper: this is beat in fair water to a pulp, which they take up in large moulds, ſo that ſome ſheets are above twelve feet in length; they are completed, by dipping them ſheet by ſheet, in alum-water, which ſerves inſtead of the ſize among us, and not only hinders the paper from imbibing the ink, but makes it look as if varniſhed over. This paper is white, ſoft, and cloſe, without the leaſt roughneſs; though it cracks more eaſily than European paper, is very ſubject to be eaten by the worms, and its thinneſs makes it liable to be ſoon worn out.

Cotton-paper is a ſort of paper which has been in uſe upwards of ſix hundred years. In the French king's library are manuſcripts on this paper, which appear to be of the Xth century; and from the XIIth century, cotton manuſcripts are more frequent than parchment ones. Cotton-paper is ſtill made in the Eaſt-Indies, by beating cotton rags to a pulp.

Linen or European paper appears to have been firſt introduced among us towards the beginning of the XIVth century; but by whom this valuable commodity was invented, is not known. The method of making paper of linen or hempen-rags, is as follows. The linen-rags being carried to the mill, are firſt ſorted, then waſhed very clean in puncheons, whoſe ſides are grated with ſtrong wires, and the bottoms bored full of holes. After this they are fermented, by laying them in heaps cloſe covered with ſacking, till they ſweat and rot, which is commonly done in four or five days. When duly fermented, they are twiſted into handfuls, cut ſmall, and thrown into oval mortars, made of well-ſeaſoned oak, about half a yard deep, with an iron-plate at bottom, an inch thick, eight inches broad, and thirty long; in the middle is a waſhing-block, grooved, with five holes in it, and a piece of hair-ſieve faſtened on the inſide; this keeps the hammers from touching it, and prevents any thing going out except the foul water. Theſe mortars are continually ſupplied with water, by little troughs from a ciſtern, fed by buckets fixed to the ſeveral floats of a great wheel, which raiſes the wooden hammers for pounding the rags in the mortars. When the rags are beaten to a certain degree, called the firſt ſtuff, the pulp is removed into boxes, made like corn-chandlers bins, with the bottom-board aſlant, and a little ſeparation on the front for the water to drain away. The pulp of the rags being in, they take away as many of the front boards as are needful, and preſs the maſs hard down with their hands; the next day they put on another board, and add more pulp, till the box is full; and here it remains mellowing a week, more or leſs, according to the weather. After this, the ſtuff is again put into clean mortars, and is beaten afreſh, and removed into boxes, as before, in which ſtate it is called the ſecond ſtuff. The maſs is beat a third time, till ſome of it being mixed with fair water, and brewed to and fro,

appears

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appears like flour and water, without any lumps in it: it is then fit for the pit-mortar, where it is perfectly diſſolved, and is then carried to the vat, to be formed into ſheets of paper. But lately, inſtead of pounding the rags to a pulp with large hammers, as above, they make uſe of an engine, which performs the work in much leſs time. This engine conſiſts of a round ſolid piece of wood, into which are faſtened ſeveral long pieces of ſteel, ground very ſharp. This is placed in a large trough with the rags, and a ſufficient quantity of water. At the bottom of the trough is a plate with ſteel bars, ground ſharp like the former; and the engine being carried round with prodigious velocity, reduces the rags to a pulp in a very ſhort time. It muſt be obſerved, that the motion of the engine cauſes the water in the trough to circulate, and by that means conſtantly returns the ſtuff to the engine. The trough is conſtantly fed with clean water at one end, while the dirty water from the rags is carried of at the other, through a hole, defended with wire gratings, in order to hinder the pulp from going out with the dirty water.

When the ſtuff is ſufficiently prepared as above, it is carried to the vat, and mixed with a proper quantity of water, which they call priming the vat. The vat is rightly primed, when the liquor has ſuch a proportion of the pulp, as that the mould, on being dipped into it, will juſt take up enough to make a ſheet of paper of the thickneſs required. The mould is a kind of ſieve exactly of the ſize of the paper to be made, and about an inch deep, the bottom being formed of fine braſs wire, guarded underneath with ſticks, to prevent it bagging down, and to keep it horizontal; and further, to ſtrengthen the bottom, there are large wires placed in parallel lines, at equal diſtances, which form thoſe lines viſible in all white paper when held up to the light: the mark of the paper is alſo made in this bottom, by interweaving a large wire in any particular form. This mould the maker dips into the liquor, and gives it a ſhake as he takes it out, to clear the water from the pulp. He then ſlides it along a groove to the coucher, who turns out the ſheet upon a felt laid on a plank, and lays another felt on it; and returns the mould to the maker, who by this time has prepared a ſecond ſheet in another mould: and thus they proceed, laying alternately a ſheet and a felt, till they have made ſix quires of paper, which is called a poſt; and this they do with ſuch ſwiftneſs, that, in many ſorts of paper, two men make twenty poſts or more in a day. A poſt of paper being made, either the maker or coucher whiſtles; on which four or five men advance, one of whom draws it under the preſs, and the reſt preſs it with great force, till all the water is ſqueezed from it; after which it is ſeparated ſheet by ſheet from the felts, and laid regularly one ſheet upon another; and having undergone a ſecond preſſing, it is hung up to dry. When ſufficiently dried, it is taken off the lines, rubbed ſmooth with the hands, and laid by till ſized, which is the next operation. For this they chuſe a fine temperate day; and having boiled a proper quantity of clean parchment, or vellum ſhavings, in water, till it comes to a ſize, they prepare a fine cloth, on which they ſtrew a due proportion of white vitriol and roch-alum finely powdered, and ſtrain the ſize through it into a large tub; in which they dip as much paper at once as they can conveniently hold, and with a quick motion give every ſheet its ſhare of the ſize, which muſt be as hot as the hand can well bear it. After this, the paper is preſſed, hung up ſheet by ſheet to dry; and being taken down, is ſorted, and what is only fit for outſide-quires laid by themſelves: it is then told into quires, which are folded and preſſed. The broken ſheets are commonly put together, and two of the worſt quires are placed on the outſide of every ream or bundle; and being tied up in wrappers, made of the ſettling of the vat, it is fit for ſale.

Paper is of various kinds, and uſed for various purpoſes: with regard to colour, it is principally diſtinguiſhed into white, blue, and brown; and with regard to its dimenſions, into atlas, elephant, imperial, ſuper-royal, royal, medium, demy, crown, foolſcap, and pot-paper.

PAPER-OFFICE, an office in the palace of Whitehall, in which all the public writings, matters of ſtate and council, proclamations, letters, intelligences, negotiations abroad, and generally all diſpaches that paſs through the offices of the ſecretaries of ſtate, are lodged, by way of library.

PAPHLAGONIA, an ancient province of the leſſer Aſia, ſituated on the Euxine ſea, now part of the province of Amaſia in Turky.

PAPHOS, once an elegant city at the weſt end of the iſland of Cyprus; but the little town of Baffo is now all that remains of it.

PAPILIO, the BUTTERFLY, in zoology, a genus of inſects belonging to the order of lepidoptera. It has four wings, imbricated with a kind of downy ſcales; the tongue is convoluted in a ſpiral form; and the body is hairy. There are 273 ſpecies, principally diſtinguiſhed by the colour of their wings.

PAPILIONACEOUS, among botaniſts, an appellation given to the flowers of plants belonging principally to the diadelphia claſs, from their reſembling the figure of a butterfly.

PAPOUS, or NEW GUINEA, a large continent in the Pacific ocean, a little ſouth of the equator; ſituated eaſt of the Spice iſlands, in 130° eaſt long. but how far it extends farther to the eaſtward or ſouthward, is uncertain.

PAPPUS, in botany, a ſoft downy ſubſtance, that grows on the ſeeds of certain plants, as thiſtles, hawkweed, *&c.* ſerving to ſcatter and buoy them up in the air.

PAR, in commerce, ſignifies any two things equal in value. See COMMERCE.

PARABLE, a fable, or allegorical inſtruction, founded on ſomething real or apparent in nature or hiſtory, from which a moral is drawn, by comparing it with ſomething in which the people are more immediately concerned; ſuch are the parables of Dives and Lazarus, of the Prodigal Son, of the Ten Virgins, *&c.*

PARABOLA. See CONIC SECTIONS.

PARACENTESIS, an operation in ſurgery, commonly called tapping. See SURGERY.

PARACLET, the COMFORTER, a name given to the Holy Ghoſt.

PARADISEA, in ornithology, a genus belonging to the order of picæ. The beak is covered with a belt or collar of downy feathers at the baſe; and the feathers on the ſides are very long. There are three ſpecies, *viz.* 1. The apoda, has the feathers on the ſides longer than the body, and two long briſtly feathers in the tail. It is the greater bird of paradiſe, and feeds upon butterflies. They are

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are found in large flocks in the Molucca iſlands. 2. The regia, has two intermediate prime tail-feathers like threads and feathery at the points. It is found in Amboina. 3. The triſtis, has a naked triangular ſpot behind the eyes; and the head and neck are of a duſky colour. It is a native of the Philippine iſles, and feeds upon graſs-hoppers and other inſects.

PARADISE, a term principally uſed for the garden of Eden, in which Adam and Eve were placed immediately upon their creation.

As to this terreſtrial paradiſe, there have been many inquiries about its ſituation. It has been placed in the third heaven, in the orb of the moon, in the moon itſelf, in the middle region of the air, above the earth, under the earth, in the place poſſeſſed by the Caſpian ſea, and under the arctic pole. The learned Huetius places it upon the river that is produced by the conjunction of the Tigris and Euphrates, now called the river of the Arabs, between this conjunction and the diviſion made by the ſame river before it falls into the Perſian ſea. Other geographers have placed it in Armenia, between the ſources of the Tigris, the Euphrates, the Araxis, and the Phaſis, which they ſuppoſe to be the four rivers deſcribed by Moſes.

The celeſtial paradiſe is that place of pure and refined delight, in which the ſouls of the bleſſed enjoy everlaſting happineſs.

Bird of PARADISE. See PARADISEA.

PARADOX, in philoſophy, a propoſition ſeemingly abſurd, as being contrary to ſome received opinion, but yet true in fact.

No ſcience abounds more with paradoxes than geometry: thus, that a right line ſhould continually approach to the hyperbola, and yet never reach it, is a true paradox; and in the ſame manner, a ſpiral may continually approach to a point, and yet not reach it, in any number of revolutions, however great.

PARÆA, in zoology. See COLUBER.

PARAGOGE, in grammar, a figure whereby a letter or ſyllable is added to the end of a word; as *med*, for *me*; *dicier*, for *dici*, &c.

PARAGUAY, or LA PLATA, a province of South America, ſubject to Spain, lies between 12° and 37° S. lat. and between 50° and 75° W. long.

PARALIPOMENA, in matters of literature, denotes a ſupplement of things omitted in a preceding work.

PARALLACTIC, in general, ſomething relating to the parallax of heavenly bodies. See PARALLAX.

PARALLAX, in aſtronomy. See ASTRONOMY, p. 452.

PARALLEL, in geometry, an appellation given to lines, ſurfaces, and bodies every where equidiſtant from each other. See GEOMETRY.

PARALLELS *of latitude*, in aſtronomy, are leſſer circles of the ſphere parallel to the ecliptic, imagined to paſs through every degree and minute of the colures.

PARALLELS *of altitude*, or ALMUCANTARS, are circles parallel to the horizon, imagined to paſs through every degree and minute of the meridian between the horizon and zenith, having their poles in the zenith.

PARALLELS *of declination*, in aſtronomy, are the ſame with parallels of latitude in geography.

PARALLEL SPHERE, that ſituation of the ſphere, wherein the equator coincides with the horizon, and the poles with the zenith and nadir.

PARALLEL SAILING. See NAVIGATION.

PARALLELOPIPED, in geometry, a regular ſolid comprehended under ſix parallelograms, the oppoſite ones whereof are ſimilar, parallel, and equal.

PARALLELOGRAM, in geometry, a quadrilateral right-lined figure, whoſe oppoſite ſides are parallel and equal to each other.

PARALLELOPIPEDIA, in natural hiſtory, the name of a genus of ſpars, thus called, becauſe regularly of a parallelopiped form.

They are pellucid cryſtalline ſpars externally of a determinate and regular figure, always found looſe, detached, and ſeparate from all other bodies, and in form of an oblique parallelopiped, with ſix parallelogram ſides and eight ſolid angles, eaſily fiſſile either in an horrizontal or perpendicular direction, being compoſed of numbers of thin plates, and thoſe of very elegantly and regularly arranged bodies, each of the ſame form with the whole maſs, except that they are thinner in proportion to their horizontal planes; and naturally fall into theſe and no other figures, on being broken with a ſlight blow.

PARALOGISM, in logic, a falſe reaſoning, or a fault committed in demonſtration, when a conſequence is drawn from principles that are falſe, or, though true, are not proved; or when a propoſition is paſſed over that ſhould have been proved by the way.

PARALYSIS, the PALSY. See MEDICINE, p. 97.

PARAMECIA, in natural hiſtory, a name given to ſuch animalcules as have no viſible limbs or tails, and are of an irregularly oblong figure.

PARAMETER, in conic ſections, a conſtant line, otherwiſe called latus rectum. See CONIC SECTIONS.

PARAMOUNT, in law, ſignifies the ſupreme lord of the fee.

PARANYMPH, among the ancients, the perſon who waited on the bridegroom, and directed the nuptial ſolemnities; called alſo pronubus, and auſpex, becauſe the ceremonies began by taking auſpicia. As the paranymph officiated only on the part of the bridegroom, a woman called pronuba officiated on the part of the bride.

PARAPET, in fortification, an elevation of earth deſigned for covering the ſoldiers from the enemies cannon or ſmall ſhot. See FORTIFICATION.

PARAPHERNAL *goods* in Scots law. See LAW, Tit. vi. 8.

PARAPHIMOSIS, in medicine, a diſorder in the penis, wherein the prepuce is ſhrunk, and withdrawn behind the glans, ſo as not to be capable of being brought to cover the ſame; which generally happens in venereal diſorders. See MEDICINE.

PARAPHRASE, an explanation of ſome text, in clearer and more ample terms, whereby is ſupplied what the author might have ſaid or thought on the ſubject; ſuch are eſteemed Eraſmus's paraphraſe on the New Teſtament, the Chaldee paraphraſe on the Pentateuch, &c.

PARAPHRENITIS, in medicine, an inflammation of the diaphragm. See MEDICINE.

PARAPHROSYNE, a word uſed by medical writers to expreſs a delirium, or an alienation of mind in fevers, or from whatever cauſe.

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PARAPLEGIA, a ſpecies of palſy. See MEDICINE. p. 97.

PARASELENE, in phyſiology, a mock moon, a meteor, or phænomenon, encompaſſing, or adjacent to, the moon, in form of a luminous ring; wherein are ſometimes obſerved one, ſometimes two, apparent images of the moon.

PARASITE, among the Greeks, was originally a very reputable title; the paraſites being a kind of prieſts, at leaſt miniſters, of the gods, in the ſame manner as the Epulones were at Rome. They took care of the ſacred corn, or the corn deſtined for the ſervice of the temples, and the gods, *viz.* ſacrifices, feaſts, *&c.* they had even the intendance over ſacrifices, and took care that they were duly performed. At Athens, there was a kind of college of twelve paraſites; each people of Attica furniſhing one, who was always choſen out of the beſt families. Polybius adds, that a paraſite was alſo an honourable title among the ancient Gauls, and was given to their poets; but of late it has been made a term of reproach, and uſed for a flatterer and mean dependant.

PARASITES, or PARASITICAL PLANTS, in botany, ſuch plants as are produced out of the trunk or branches of other plants, from whence they receive their nouriſhment, and will not grow upon the ground, as the miſleto, *&c.*

PARASTATÆ, in anatomy. See ANATOMY, p. 270.

PARASYNANCHE, in medicine, a kind of angina, or quinſey. See MEDICINE, p. 84.

PARATHENAR, in anatomy. See ANAT. p. 212.

PARBUNCLE, in a ſhip, the name of a rope almoſt like a pair of ſlings: it is ſeized both ends together, and then put double about any heavy thing that is to be hoiſted in or out of the ſhip; having the hook of the runner hitched into it, to hoiſe it up by.

PARCÆ, in the heathen mythology, goddeſſes, who were ſuppoſed to preſide over the accidents and events, and to determine the date or period, of human life. See MYTHOLOGY.

PARCHMENT, the ſkins of ſheep or goats prepared after ſuch a manner as to render it proper for writing upon, covering books, *&c.*

The manufacture of parchment is begun by the ſkinner, and finiſhed by the parchment-maker.

The ſkin having been ſtripped of its wool, and placed in the lime pit, the ſkinner ſtretches it on a kind of frame, and pares off the fleſh with an iron inſtrument: this done, it is moiſtened with a rag; and powdered chalk being ſpread over it, the ſkinner takes a large pumice-ſtone, flat at bottom, and rubs over the ſkin, and thus ſcowers off the fleſh: he then goes over it again with the iron inſtrument, moiſtens it as before, and rubs it again with the pumice-ſtone without any chalk underneath: this ſmooths and ſoftens the fleſh-ſide very conſiderably. He then drains it again, by paſſing over it the iron inſtrument as before. The fleſh-ſide being thus drained, by ſcraping off the moiſture, he in the ſame manner paſſes the iron over the wool or hair ſide: then ſtretches it tight on a frame, and ſcrapes the fleſh ſide again: this finiſhes its draining; and the more it is drained, the whiter it becomes. The ſkinner now throws on more chalk, ſweeping it over with a piece of lamb ſkin that has the wool on; and this ſmooths it ſtill farther. It is now left to dry; and when dried, taken off the frame, by cutting it all round. The ſkin, thus far prepared by the ſkinner, is taken out of his hands by the parchment-maker; who firſt, while it is dry, pares it on a ſummer (which is a calf-ſkin ſtretched in a frame) with a ſharper inſtrument than that uſed by the ſkinner, and, working with the arm from the top to the bottom of the ſkin, takes away about one half of its thickneſs. The ſkin, thus equally pared on the fleſh-ſide, is again rendered ſmooth, by being rubbed with the pumice-ſtone on a bench covered with a ſack ſtuffed with flocks, which leaves the parchment in a condition fit for writing upon. The parings thus taken off the leather, are uſed in making glue, ſize, *&c.*

What is called vellum, is only parchment made of the ſkins of abortives, or at leaſt ſucking calves. This has a much finer grain, and is whiter and ſmoother than parchment; but is prepared in the ſame manner, except its not being paſſed through the lime-pit.

PARDALUS. See LEO.

PAREGORICS in pharmacy, medicines that aſſwage pain, otherwiſe called anodynes.

PAREIRA BRAVA, in the materia medica, a kind of oblong and large root, brought from the Braſils.

It is certainly a diuretic of no mean character, and has done great ſervice in nephritic caſes; and in pleuriſies and quinſeys it has been attended with more ſucceſs than almoſt any medicine we know of ſingly.

PARELCON, in grammar, a figure by which a word or ſyllable is added to the end of another.

PAREMBOLE, in rhetoric, a figure wherein ſomething relating to the ſubject is inſerted in the middle of a period. All the differences between the parembole and parentheſis, according to Voſſius, is, that the former relates to the ſubject in hand, whereas the latter is foreign to it.

PARENCHYMA, in anatomy, a term introduced by Eraſiſtratus, ſignifying all that ſubſtance which is contained in the interſtices betwixt the blood-veſſels of the viſcera, which he imagined to be extravaſated and concreted blood.

PARENCHYMA *of plants.* Grew applies the term parenchyma to the pith or pulp, or that inner part of a fruit or plant through which the juice is ſuppoſed to be diſtributed. See AGRICULTURE.

PARENT, a term of relation applicable to thoſe from whom we immediately receive our being.

PARENTALIA, in antiquity, funeral obſequies, or the laſt duties paid by children to their deceaſed parents.

PARENTHESIS, in grammar, certain intercalary words, inſerted in a diſcourſe, which interrupt the ſenſe, or thread, but ſeem neceſſary for the better underſtanding of the ſubject.

PARENZO, or PIRENZO, a port-town of Iſtria, in the territory of Venice, ſituated on a bay of the gulph of Venice, twenty-five miles ſouth of Cabo de Iſtria.

PARESIS, in medicine, is defined to be a palſy of the bladder, wherein the urine is either ſuppreſſed, or diſcharged involuntarily.

PARETONIUM, in natural hiſtory, the name of an earth anciently found on the ſhores of Egypt, Cyrene, and the iſland of Crete, and uſed by the ancients in painting.

PARGET, in natural hiſtory, a name given to ſeveral kinds of gypſum, or plaſter-ſtone.

PARGETING, in building, is uſed for the plaſtering of walls, and ſometimes for plaſter itſelf.

PAR-

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PARHELIUM, or PARHELION, in phyſiology, a mock ſun, or meteor, in form of a very bright light, appearing on one ſide of the ſun.

The parhelia are formed by the reflection of the ſun's beams on a cloud properly poſited. They uſually accompany the coronæ, or luminous circles, and are placed in the ſame circumference and at the ſame height. Their colours reſemble that of the rainbow, the red and yellow are on the ſide towards the ſun, and the blue and violet on the other. There are coronæ ſometimes ſeen without parhelia, and *vice verſa*.

Parhelia are double, triple, *&c.* and in 1629 a parhelion of five ſuns was ſeen at Rome, and in 1666 another at Arles of ſix.

M. Mariotte accounts for parhelia from an infinity of little particles of ice floating in the air, that multiply the image of the ſun by refraction or reflection; and by a geometrical calculus he has determined the preciſe figure of theſe little icicles, their ſituation in the air, and the ſize of the coronæ of circles which accompany the parhelia, and the colours wherewith they are painted.

PARIA, a lake of Peru, in South America, in the province of Los Charcas, ſituated in 67° W. long. and 22° S. lat.

PARIETALIA OSSA, in anatomy. See ANATOMY, p. 154.

PARIETARIA, in botany, a genus of the polygamia monœcia claſs. The calix, both in the female and hermaphrodite, conſiſts of four ſegments; none of them have any corolla; the hermaphrodite has four ſtamina; and both have one ſtylus, and one long ſeed. There are ſix ſpecies, only one of them, *viz.* the officinalis, or pellitory of the wall, is a native of Britain. It is eſteemed as cooling and abſtergent.

PARIS, in botany, a genus of the octandria trigynia claſs. The calix conſiſts of four leaves, and the corolla of four narrow petals; and the berry has four cells. There is but one ſpecies, *viz.* the quadrifolia, herb-paris, or true-love, a native of Britain.

PARIS, in geography, the metropolis of the kingdom of France, and of the principality or government of the iſle of France, ſituated in E. long. 2° 25′, N. lat 48° 50′, two hundred miles ſouth-eaſt of London, ſix hundred and eighty north-eaſt of Madrid, five hundred and fifty weſt of Vienna, one thouſand three hundred north-weſt of Conſtantinople, and ſeven hundred north-weſt of Rome.

PARISH, the precinct of a parochial church, or a circuit of ground inhabited by people who belong to one church and are under the particular charge of its miniſter.

PARK, a large incloſure privileged for wild beaſts of chace, either by preſcription or the king's grant.

PARKINSONIA, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of four ſegments, and the corolla of four oval petals, the loweſt being kidney-ſhaped; it has no ſtylus; and the pod is cylindrical.

PARLEY, a conference with an enemy. Hence to beat or ſound a parley, is to give a ſignal for holding ſuch a conference by beat of drum or ſound of trumpet.

PARLIAMENT, is the grand aſſembly of the three ſtates of this kingdom, ſummoned together, by the king's authority, to conſult of matters relating to the public welfare, and particularly to enact and repeal laws. It conſiſts of the king, the lords ſpiritual and temporal, and the commons, and is at once the ſeat of the legiſlative authority, and the higheſt court of juſtice in Great-Britain. In the houſe of lords, criminal cauſes are tried on the impeachment of the commons; and this houſe has an original juriſdiction for the trial of peers upon indictments found by a grand jury; the lords likewiſe try ſuch cauſes as come thither on appeals from the court of chancery, and all their decrees are as judgments. The houſe of commons examine the right of elections; regulate diſputes concerning them; may expel their own members, and commit them to priſon. They are the grand inqueſt of the nation; and preſent public grievances or delinquents to the king and lords, in order to their being puniſhed. In ſhort, they are the repreſentatives of all the commons in the kingdom; and in them their conſtituents have placed the higheſt confidence, by inveſting them with the power of making laws, and entruſting them with all their liberties and privileges.

Originally, new parliaments were called every year; but by degrees their term grew longer. In the reign of king Charles II. they were held a long time, with great interruptions between: but both methods were found of ſuch ill conſequence, that, in the beginning of the reign of king William III. an act was paſſed, by which the term of all parliaments was reſtrained to three ſeſſions, or three years; this was hence called the triennial act: but ſince that time, from other views, the period of parliaments has been lengthened to ſeven years. A parliament is called by the king's writ or letter directed to each lord, commanding him to appear; and by other writs, directed to the ſheriffs of each county, to ſummon the people to elect two knights for each county, and one or two burgeſſes for each borough. The number of the members in the houſe of lords is uncertain, as increaſing at the king's pleaſure. The members of the houſe of commons, when full, are five hundred and fifty-three; *viz.* ninety-two knights of the ſhires; fifty-two deputies for twenty-five cities, London having four; ſixteen for the eight cinque-ports; two for each univerſity; three hundred and thirty-two for an hundred and eighty boroughs; twelve for the boroughs in Wales, and forty-five members for Scotland. If three hundred of theſe members are met, it is reckoned a full houſe; and forty may compoſe a houſe for the diſpatch of buſineſs.

Upon the holding of a parliament, the king, the firſt day, ſits in the upper-houſe, under a canopy, with the crown on his head, and dreſſed in his royal robes; and there, by himſelf, or the lord chancellor, declares the reaſons of their meeting, in the preſence of both the lords and commons; and then the commons are required to chuſe a ſpeaker, who is preſented to the king, and being approved by his majeſty, the buſineſs of the parliament goes on.

The lords and commons ſit each in a diſtinct apartment: in the houſe of lords, the princes of the blood ſit by themſelves on the ſides of the throne; at the wall, on the king's right hand, the two archbiſhops ſit by themſelves on a form. Below them, the biſhops of London, Durham, and Wincheſter, and all the other biſhops, ſit according to the priority of their conſecration. On the king's left hand the lord-treaſurer, lord preſident, and lord privy-ſeal, ſit upon forms above all dukes, except the royal blood; then the dukes, marquiſſes, and earls, according;

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cording to their creation. Acroſs the room are wool-ſacks, continued from an ancient cuſtom; and the chancellor, or keeper, being of courſe the ſpeaker of the houſe of lords, ſits on the firſt wool-ſack before the throne, with the great ſeal or mace lying by him; below theſe are forms for the viſcounts and barons. On the other wool ſacks are ſeated the judges, maſters in chancery, and king's council, who are only to give their advice in points of law: but they all ſtand up till the king gives them leave to ſit. The commons ſit promiſcuouſly; only the ſpeaker has a chair at the upper end of the houſe, and the clerk and his aſſiſtant ſit at a table near him. Before any buſineſs is done, all the members of the houſe of commons take the oaths of allegiance and ſupremacy, *&c.* and ſubſcribe their opinions againſt tranſubſtantiation, *&c.* and if any member of that houſe votes, or ſits there during any debate, after the ſpeaker is choſen, without having firſt taken theſe oaths, between the hours of nine and four, in a full houſe, he is adjudged a Popiſh recuſant convict, and incapable of any office, and forfeits five hundred pounds. The ſame teſt the lords too, though they do not take the oaths, are obliged to comply with. When the parliament is thus met, no members are to depart from it without leave. Upon extraordinary occaſions, all the members are ſometimes ſummoned; in which caſe every lord ſpiritual and temporal, and every knight, citizen, and burgeſs, is to come to parliament, except he can reaſonably and honeſtly excuſe himſelf; or be amerced; that is, reſpectively, a lord by the lords, and a commoner by the commons.

All members of parliament, in order that they may attend the public ſervice of their country, have the privilege for themſelves of being free from arreſts, attachments, impriſonment, *&c.* for debts, treſpaſſes, *&c.* but not from arreſts for treaſon, felony, and breach of the peace.

As to the election of members, it is enacted, That candidates ſhall not make any preſents of money to, or treat the electors, after the teſt of the writ of the ſummons, or the iſſuing out of the writs for elections, or after any ſeat for a member of parliament is become vacant; in caſe they do, they are declared incapable of ſerving as members, by 7 W. III. c. 4. And farther, an oath is to be taken by electors, That they have not either received, or had any money, gift, reward, or any office, place, employment, or even promiſe of money, gift, *&c.* to them or their uſe, to give their votes; and in theſe caſes, if they aſk, take, or contract for money or reward, either by gift or other device, to give or refuſe their votes for any one; or if perſons, by gift, *&c.* corruptly procure any elector to give his vote; they ſhall forfeit five hundred pounds, and be totally diſabled to vote at any election of members of parliament, as alſo to hold any office, franchiſe, *&c.* Likewiſe officers who admit perſons to vote without their taking the aforementioned oath, in caſe the ſame be demanded, incur a forfeiture of one hundred pounds; and an oath is to be adminiſtred to all the returning officers, that they have not received any money, gift, or place, for the making of their returns: 2 Geo. II. c. 24. 9 Geo. II. c. 38. A knight of the ſhire muſt be worth ſix hundred pounds a-year in land, and all other members three hundred pounds.

Anciently all the people had votes in elections, till it was enacted by Henry VI. that none but freeholders, who had a yearly revenue of forty ſhillings, ſhould be admitted to vote for knights of the ſhire.

The manner of debating upon, and paſſing bills in parliament, is as follows: Any member may move to have a bill brought in, which, upon a queſtion put, being agreed to by the majority, this perſon, with others, is ordered to prepare and bring in the ſame. When it is ready, a time is appointed for its being read; and after the clerk's reading it, the ſpeaker reads an abſtract of it, and puts the queſtion whether or no it ſhall have a ſecond reading; and after a ſecond reading, the queſtion is put whether or no it ſhall be committed, which is either to a commitee of the whole houſe if it be of importance, or to a private commitee, any member naming the perſons. The committee being appointed, and a chairman choſen, the chairman reads the bill paragraph by paragraph, puts every clauſe to the queſtion, fills up the blanks, and makes amendments, according to the opinion of the majority. The bill thus gone through, the chair-man makes his report at the ſide-bar of the houſe, reads all the additions and amendments, *&c.* and moves for leave to bring up the report to the table; which granted, he delivers it to the clerk, who reads the amendments, *&c.* The ſpeaker then puts the queſtion whether they ſhall be read a ſecond time; and, if agreed to, he reads them himſelf. To ſo many of the amendments as the houſe acquieſces in, the queſtion is now put, Whether the bill, thus amended, ſhall be ingroſſed and written fair upon parchment, and read a third time? and the bill being ingroſſed, the ſpeaker holds it in his hand, and aſks if it ſhall paſs. If the majority be for it the clerk writes on it, *Soit baille aux ſeigneurs*, "Let it be delivered to the lords;" or if in the houſe of lords, *Soit baille aux communes*, "Let it be delivered to the commons." If a bill be rejected, it cannot be any more propoſed during that ſeſſion. A bill for a general pardon has but one reading.

When a member of the houſe of commons ſpeaks, he ſtands up uncovered, and directs his ſpeech to the ſpeaker only. If what he ſays be anſwered by another, he is not allowed to reply the ſame day, unleſs perſonal reflections have been caſt upon him: but when the commons, in order to have a greater freedom of debate, have reſolved themſelves into a comittee of the whole houſe, every member may ſpeak to a queſtion as often as he thinks neceſſary. In the houſe of lords they vote, beginning at the puiſne, or loweſt baron, and ſo up orderly to the higheſt, every one anſwering *Content* or *Not content*. In the houſe of commons they vote by *yeas* and *nays*; and if it be dubious which are the greater number, the houſe divides. If the queſtion be about bringing any thing into the houſe, the *yeas* go out; but if it be about any thing the houſe already has, the *nays* go out. In all diviſions the ſpeaker appoints four tellers, two of each opinion. In a committee of the whole houſe, they divide by changing ſides, the *yeas* taking the right and the *nays* the left of the chair; and then there are but two tellers. If a bill paſs one houſe, and the other demur to it, a conference is demanded in the painted chamber, where certain members are deputed from each houſe; and here the lords ſit covered, and the commons ſtand bare and debate the caſe. If they diſagree, the affair is null; but if they agree,

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gree, this, with the other bells that have paſſed both houſes, is brought down to the king in the houſe of lords, who comes thither cloathed in his royal robes; before him the clerk of the parliament reads the title of each bill, and as he reads, the clerk of the crown pronounces the royal aſſent or diſſent. If it be a public bill, the royal aſſent is given in theſe words, *Le roy le veut*, "The king will have it ſo;" if private, *Soit fait comme il eſt deſiré*, "Let the requeſt be complied with:" if the king refuſes the bill, the anſwer is, *Le roy s'aviſera*, "The king will think of it," and if it be a money-bill, the anſwer is, *Le roy remercie ſes loyaux ſujets, accepte leur benevolence, & auſſi le veut*; "The king thanks his loyal ſubjects, accepts their benevolence, and therefore grants his conſent."

PARLIAMENTS *of France*, are ſovereign courts, eſtabliſhed by the king, finally to determine all diſputes between particular perſons, and to pronounce on appeals from ſentences given by inferior judges. There are ten of theſe parliaments in France, of which that of Paris is the chief, its privileges and juriſdiction being of the greateſt extent. It conſiſts of ſix chambers, *viz.* the grand chamber, where cauſes of audience are pleaded; and five chambers of inqueſt, where proceſſes are adjudged in writing. This parliament enjoys the privileges of verifying and regiſtring the king's arrets or edicts, without which thoſe edicts are of little or no value.

PARLIAMENT *of Sweden*, conſiſts of four eſtates, with the king at their head: Theſe ſtates are, 1. The nobility and repreſentatives of the gentry; with whom the colonels, lieutenant-colonels, majors, and captains of every regiment, ſit and vote. 2. The clergy; one of which body is elected from every rural deanery of ten pariſhes; who, with the biſhops and ſuperintendants, amount to about two hundred. 3. The burghers, elected by the magiſtrates and council of every corporation as their repreſentatives, of whom there are four for Stockholm, and two for every other town, amounting in the whole to about an hundred and fifty. 4. The peaſants, choſen by the peaſants out of every diſtrict; who chuſe one of their own rank, and not a gentleman, to repreſent them: theſe amount to about two hundred and fifty.

All theſe generally meet at Stockholm; and after the ſtate-affairs have been repreſented to them from the throne, they ſeparate, and ſit in four ſeveral chambers or houſes, in each of which affairs are carried on by majority of votes; and every chamber has a negative in the paſſing any law.

PARMA, the capital of the duchy of Parma, in Italy, ſixty miles north-eaſt of Genoa, is pleaſantly ſituated on a river to which it gives name: E. long. 11°, N. lat. 44° 45′.

PARNASSIA, in botany, a genus of the pentandria tetragynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; it has five cordated nectaria, with round buttons on their points; and the capſule has four valves. There is but one ſpecies, *viz.* the paluſtris, or graſs of Parnaſſus, a native of Britain.

PARNASSUS, a mountain of Greece, much celebrated by ancient poets, ſituated near Caſtro in Livadia.

PARODY, a popular maxim, adage, or proverb.

Parody is alſo a poetical pleaſantry, conſiſting in applying the verſes written on one ſubject, by way of ridicule to another; or in turning a ſerious work into a burleſque, by affecting to obſerve, as nearly as poſſible, the ſame rhymes, words, and cadences.

PARONOMASIA, in rhetoric, a pun; or a figure whereby words nearly alike in ſound, but of very different meanings, are affectedly or deſignedly uſed.

PAROS, one of the ſmalleſt iſlands of the Cyclades, famous for its marble, ſituated in E. long. 25° 30′, N. lat. 36° 30′.

PAROTIDES, in anatomy. See ANATOMY, p. 270.

PAROXYSM, in medicine, the ſevere fit of a diſeaſe, under which it grows higher, or exaſperates, as of the gout, *&c.*

PARRELS, in a ſhip, are frames made of trucks, ribs, and ropes, which having both their ends faſtened to the yards, are ſo contrived, as to go round about the maſts; that the yards, by their means, may go up and down upon the maſt; theſe alſo, with the breaſt-ropes, faſten the yards to the maſts.

PARRICIDE. See LAW, Tit. xxxiii. 19.

PARROT, in ornithology. See PSITTACUS.

PARSLEY, in botany. See APIUM.

PARSNEP, in botany. See PASTINACA.

PARSON, the rector or incumbent of a pariſh-church.

PARSONAGE, a rectory or pariſh-church, endowed with a houſe, glebe, lands, tithes, *&c.* for the maintenance of a miniſter, with cure of ſouls within ſuch pariſh.

PARTS *of ſpeech*, in grammar, are all the ſorts of words which enter the compoſition of diſcourſe. See GRAMMAR.

PARTERRE, in gardening, a level diviſion of ground, which, for the moſt part, faces the ſouth and beſt front of an houſe; and is generally furniſhed with greens, flowers, *&c.*

PARTHENIUM, in botany, a genus of the monœcia pentandria claſs. The common calix of the male conſiſts of five leaves; and the corolla of the diſk are monopetalous. The corollæ of the radius in the female are five; two of each ſide are males, and the intermediate one female, above a naked ſeed. There are two ſpecies, none of them natives of Britain.

PARTHIA, a country of Aſia, formerly ſo called, ſituated almoſt in the middle of the modern Perſia.

PARTI, PARTIE, PARTY, or PARTED, in heraldry, is applied to a ſhield or eſcutcheon, denoting it divided or marked out into partitions.

Parti per pale is when the ſhield is divided perpendicularly into two halves, by a cut in the middle from top to bottom. See Plate CXXXIV. fig. 11.

Parti per feſs is when the cut is acroſs the middle, from ſide to ſide.

Parti per bend dexter, is when the cut comes from the upper corner of the ſhield, on the right hand, and deſcends athwart to the oppoſite lower corner.

Parti per bend ſiniſter, is when the cut, coming from the upper left corner, deſcends acroſs to the oppoſite lower one.

From theſe four partitions have proceeded an infinite number of others, of various and extravagant forms.

PARTICIPLE, in grammar, an adjective formed of a verb, ſo called becauſe it participates partly of the properties of a noun, and partly of thoſe of a verb. See GRAMMAR.

PARTICLE, in phyſiology, the minute part of a body,

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an aſſemblage of which conſtitute all natural bodies.

It is the various arrangement and texture of theſe particles, with the difference of coheſion, *&c.* that conſtitute the various kinds of bodies. The ſmalleſt particles cohere with the ſtrongeſt attraction, and compoſe bigger particles of weaker coheſion; and many of theſe cohering compoſe bigger particles, whoſe vigour is ſtill weaker; and hereupon the operations in chemiſtry, and the colours of natural bodies, depend, and which, by cohering, compoſe bodies of ſenſible bulk. The coheſion of the particles of matter, the Epicureans imagined, was effected by means of hooked atoms; the Ariſtotelians, by reſt; but Sir Iſaac Newton ſhews, that it is done by means of a certain power, whereby the particles mutually attract and tend towards each other. By this attraction of the particles, he ſhews, that moſt of the phænomena of the leſſer bodies are affected, as thoſe of the heavenly bodies are, by the attraction of gravity.

PARTICLE, in grammar, a denomination for all thoſe ſmall words that tie or untie others together, or that expreſs the modes or manners of words. See GRAMMAR.

PARTNER, and PARTNERSHIP. See ARITHMETIC, p. 386.

PARTRIDGE, in ornithology. See TETRAO.

PARTURITION. See DELIVERY.

PARULIDES, in ſurgery, tumours and inflammations of the gums, commonly called gum-boils.

They are to be treated with diſcutients, like other inflammatory tumours.

PARUS, in ornithology. See CERTHIA.

PASCHAL, ſomething belonging to the paſſover or eaſter. See PASSOVER, and EASTER.

PAISLEY, a town of Scotland, in the county of Renfrew, ſix miles weſt of Glaſgow.

PASQUIN, a mutilated ſtatue at Rome, in a corner of the palace of the Urſini: it takes its name from a cobler of that city called Paſquin, famous for his ſneers and gibes, and who diverted himſelf with paſſing his jokes on all the people who went through that ſtreet. After his death, as they were digging up the pavement before his ſhop, they found in the earth the ſtatue of an ancient gladiator, well cut, but maimed, and half ſpoiled: this they ſet up in the place where it was found, and by common conſent named it Paſquin. Since that time, all ſatires are attributed to that figure; and are either put into its mouth, or paſted upon it, as if they were wrote by Paſquin redivivus; and theſe are addreſſed by Paſquin to Marforio, another ſtatue at Rome. When Marforio is attacked, Paſquin comes to his aſſiſtance; and when Paſquin is attacked, Marforio aſſiſts him in his turn.

PASQUINADE, a ſatirical libel faſtened to the ſtatue of Paſquin: theſe are commonly ſhort, merry, and pointed; and from hence the term has been applied to all other lampoons of the ſame caſt.

PASSADE, in the menage, is a turn or courſe of a horſe backwards or forwards, on the ſame ſpot of ground.

Birds of PASSAGE, a name given to thoſe birds which at certain ſtated ſeaſons of the year remove from certain countries, and at other ſtated times return to them again, as our quails, woodcocks, ſtorks, nightingales, ſwallows, and many other ſpecies. Among the birds of paſſage, the fieldfare, the redwing, the woodcock, and the ſnipe, come to us in the autumn, at the time when the ſummer-birds are leaving us, and go from us again in ſpring, at the time when theſe return; and of theſe the two laſt often continue with us through the ſummer, and breed; ſo that the two firſt ſeem the only kinds that certainly leave us at the approach of ſpring, retiring to the northern parts of the continent, where they live during the ſummer, and breed; and at the return of winter, are driven ſoutherly from thoſe frigid climes, in ſearch of food, which there the ice and ſnow muſt deprive them of.

PASSANT, in heraldry, a term applied to a lion, or other animal, in a ſhield, appearing to walk leiſurely: for moſt beaſts, except lions, the term trippant is frequently uſed inſtead of paſſant.

PASSAO, or CAPE PASSAO, a promontory of Peru, juſt under the equator: W. long 81°.

PASSAU, the capital of the biſhopric of the ſame name, in the circle of Bavaria, ſituated on the confluence of the rivers Danube, Inn, and Ilts: E. long. 13° 30′, N. lat. 48° 30′.

PASSERES is the name of a claſs of birds. See NATURAL HISTORY.

PASSERINA, in botany, a genus of the octandria monogynia claſs. It has no calix; the corolla conſiſts of four ſegments, and the ſtamina lie upon the tube. There are eight ſpecies, none of them natives of Britain.

PASSIFLORA, in botany, a genus of the gynandria pentagynia claſs. It has three ſtyli; the calix conſiſts of five leaves, and the corolla of five petals; and the nectarium is a corona; and the berry is ſupported on a pedicle. There are 26 ſpecies, none of them natives of Britain, but are cultivated in gardens for the beauty of their flowers.

PASSIONS, in moral philoſophy, are certain motions of the ſoul, which make it purſue what appears to be good, and avoid whatever threatens evil.

By reflecting, ſays Mr Locke, on the various modifications or tempers of the mind, and the internal ſenſations which pleaſure and pain, good and evil, produce in us, we may thence form to ourſelves the ideas of our paſſions. Thus, by reflecting upon the thought we have of the delight which any thing is apt to produce in us, we form an idea which we call love. Deſire is that uneaſineſs which a man finds in himſelf upon the abſence of any thing, the preſent enjoyment of which cauſes delight. Joy is a delight of the mind, ariſing from the preſent, or aſſured approaching, poſſeſſion of ſome good. Sorrow is an uneaſineſs of the mind, upon the thought of a good loſt, or the ſenſe of a preſent evil. Hope is a pleaſure in the mind, upon the thought of a probable future enjoyment of a thing which is apt to delight. Fear is an uneaſineſs of the mind, upon the thought of a future evil likely to befal us. Anger is a diſcompoſure of the mind, upon the receipt of injury, with a preſent purpoſe of revenge. Deſpair is the thought of the unattainableneſs of any good. Envy is an uneaſineſs of mind, cauſed by the conſideration of a good we deſire, obtained by one we think ſhould not have had it before us.

On the juſt regulation and ſubordination of the paſſions, depends, in a great meaſure, the happineſs of mankind. See MORAL PHILOSOPHY.

PASSIONS, in medicine, make one of the non-naturals, and produce very ſenſible effects. Joy, anger, and fear, are

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are the principal. In the two firſt, the ſpirits are hurried with too great vivacity; whereas, in fear or dread, they are is it were curbed and concentrated: whence we may conclude, that they have a very bad effect upon health; and therefore it will be beſt to keep them within bounds as much as poſſible, and to preſerve an inward ſerenity, calmneſs, and tranquillity.

PASSIONS, in painting, are the external expreſſions of the different diſpoſitions and affections of the mind: but particularly their different effects upon the ſeveral features of the face: for though the arms, and indeed every part of the body, ſerve likewiſe, by their quick, languid, and variouſly diverſified motions, to expreſs the paſſions of the ſoul; yet, in painting, this difference is moſt conſpicuous in the face.

In ſorrow, joy, love, ſhame, and compaſſion, the eyes ſwell all of a ſudden, are covered with a ſuperabundant moiſture, and drop tears; and in grief eſpecially, the corners of the mouth hang down, the eye-lids are half ſhut, and the pupil of the eye is elevated and half covered; and all the other muſcles of the face are relaxed, ſo that the viſage appears longer than ordinary.

In fear, terror, fright, and horror, the eye-brows are greatly elevated; the eye lids are expanded as wide as poſſible, ſo as to diſcover the white of the eye; and the pupil is depreſſed, and half covered by the lower eye-lid; the hair ſtands an end; the mouth is at the ſame time wide open; and the lips ſo far drawn back, that the teeth both of the upper and under jaw appear.

Contempt is expreſſed by raiſing one ſide of the upper lip, ſo as to diſcover the teeth, whilſt the other ſide has a movement like that in laughter; the eye, on that ſide where the teeth appear, is half ſhut, whilſt the other remains open; however, both the pupils are depreſſed.

In jealouſy, envy, hatred, and malice, the eye brows are knit; and, in laughter, all the parts agree, tending as it were towards the centre of the face.

PASSION, *or croſs of the* PASSION, in heraldry, is ſo called, becauſe reſembling the ſhape of that on which our Saviour is thought to have ſuffered; that is, not croſſed in the middle, but a little below the top, with arms ſhort in proportion to the length of the ſhaft. See plate CXXXIV. fig 12.

PASSION-FLOWER, in botany. See PASSIFLORA.

PASSION-WEEK, the week immediately preceding the feſtival of Eaſter: ſo called, becauſe in that week our Saviour's paſſion and death happened.

The Thurſday of this week is called Maunday Thurſday; the Friday, Good Friday; and the Saturday, the great Sabbath.

PASSIVE, in general, denotes ſomething that ſuffers the action of another called an agent or active power.

In grammar, the verb or word that expreſſes this paſſion, is termed a paſſive verb: which, in the learned languages, has a peculiar termination, as *amor*, *doceor*, &c. in Latin.

PASSIVE TITLE, in Scots law. See LAW, Tit. xxvii. 30.

PASSOVER, a ſolemn feſtival of the Jews, celebrated on the fourteenth day of the month next after the vernal equinox, and inſtituted in commemoration of their coming out of Egypt; becauſe on the night before their departure the deſtroying angel, who put to death the firſt born of the Egyptians, paſſed over the houſes of the Hebrews, which were ſprinkled with the blood of a lamb. The whole tranſaction is related in the twelfth chapter of Exodus.

PASS PAROLE, a command given at the head of an army, and thence communicated to the rear by paſſing it from mouth to mouth.

PASS-PORT, or PASS, a licence or writing obtained from a prince or governor, granting liberty and ſafe conduct to paſs through his territories without moleſtation.

PASTEBOARD, a kind of thick paper formed of ſeveral ſheets of paper paſted together.

The chief uſe of paſteboard is in binding books, making letter-caſes, *&c.*

PASTERN *of a horſe*, in the manege, is the diſtance between the joint next the foot, and the coronet of the hoof. This part ſhould be ſhort, eſpecially in middle-ſized horſes, becauſe long paſterns are weak, and cannot ſo well endure travelling.

PASTERN-JOINT, the joint next a horſe's foot.

PASTIL, or PASTEL, among painters, a kind of paſte made of different colours, ground up with gum-water, in order to make crayons

PASTIL, in pharmacy, is a dry compoſition of ſweet-ſmelling reſins, aromatic woods, *&c.* ſometimes burnt to clear and ſcent the air of a chamber.

PASTINACA, in botany, a genus of the pentandria digynia claſs. The fruit is elliptical, and compreſſed. There are two ſpecies, none of them natives of Britain; but the ſativa, or parſnep, is cultivated in gardens for the ſake of its root, which we uſe as food.

PASTORAL, in general, ſomething that relates to ſhepherds; hence we ſay, paſtoral life, manners, poetry, *&c.*

The original of poetry is aſcribed to that age which ſucceeded the creation of the world: and as the keeping of flocks ſeems to have been the firſt employment of mankind, the moſt ancient ſort of poetry was, probably, paſtoral. It is natural to imagine, that the leiſure of thoſe ancient ſhepherds admitting and inviting ſome diverſion, none was ſo proper to that ſolitary and ſedentary life as ſinging; and that in their ſongs they took occaſion to celebrate their own felicity. From hence a poem was invented, and afterwards improved to a perfect image of that happy time; which, by giving us an eſteem for the virtues of a former age, might recommend them to the preſent. And ſince the life of ſhepherds was attended with more tranquillity than any other rural employment, the poets choſe to introduce their perſons, from whom it received the name of Paſtoral.

A paſtoral is an imitation of the action of a ſhepherd, or one conſidered under that character. The form of this imitation is dramatic, or narrative, or mixed with both; the fable ſimple; the manners not too polite, nor too ruſtic; the thoughts are plain, yet admit a little quickneſs and paſſion, but that ſhort and flowing; the expreſſion humble, yet as pure as the language will afford; neat, but not florid; eaſy, and yet lively. In ſhort, the fable, manners, thoughts, and expreſſions, are full of the greateſt ſimplicity in nature.

The complete character of this poem conſiſts in ſimplicity, brevity, and delicacy; the two firſt of which render an eclogue natural, and the laſt delightful.

PASTRY, that branch of cookery, which is chiefly taken up in making pies, paſties, cakes, *&c.*

PASTURE, or PASTURE-LAND, that reſerved for feeding cattle.

Paſture-

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Paſture land is of ſuch advantage to huſbandry, that many prefer it even to corn-land, becauſe of the ſmall hazard and labour that attends it, and as it lays the foundation for moſt of the profit that is expected from the arable land, becauſe of the manure the cattle afford which are fed upon it. Where dung is not to be bought, as is often the caſe in places diſtant from large towns, the farmer is forced to proportion his arable to his paſture-land, in ſuch manner, that the cattle fed on the latter may be ſufficient for a ſupply of dung, ſo neceſſary for producing the fruits of the former.

PATAGONIA, the moſt ſouthern part of ſouth America, extending from the mouth of Rio di la Plata, in 36° of S. lat. to Cape Horn, in 55° 30′.

PATAGONULA, or PATAGONICA, in botany, a genus of the pentandria monogynia claſs. The corolla is rotated; and the ſtylus is dichotomous. There is but one ſpecies, a native of America.

PATAN, the capital of a province in the Eaſt Indies, ſituated two hundred miles north of Huegly in Bengal: E. long. 89°, N. lat. 27° 30′.

PATAVINITY, among critics, denotes a peculiarity of Livy's diction, derived from Patavium, or Padua, the place of his nativity; but wherein this patavinity conſiſts, they are by no means agreed.

PATCHUCA, or PATIOQUE, a city of Mexico, W. long. 103°, N. lat. 21°; ſubject to Spain.

PATE, in fortification, a kind of platform, reſembling what is called an horſe-ſhoe.

PATE'E, or PATTE'E, in heraldry, a croſs, ſmall in the centre, and widening to the extremes, which are very broad. See Plate CXXXIV. fig. 13. which is a croſs patee, argent, upon a field ſable.

PATELLA, in anatomy. See ANATOMY, p. 185.

PATELLA, the LIMPET, is a genus of inſects belonging to the order of vermes teſtacea. It is an animal of the ſnail kind; the ſhell conſiſts of one conical valve, without any ſpiral. There are 36 ſpecies, principally diſtinguiſhed by peculiarities in their ſhells.

PATENT, in general, denotes ſomething that ſtands open or expanded: thus a leaf is ſaid to be patent when it ſtands almoſt at right angles with the ſtalk.

PATENT, or LETTERS-PATENT. See LETTER.

PATER PATRATUS, in Roman antiquity, the principal perſon among the feciales or college of heralds.

PATER NOSTER, the Lord's-prayer, ſo called from the two firſt words thereof in Latin.

PATH, in general, denotes the courſe or tract marked out or run over by a body in motion. For the path of the moon, *&c.* ſee ASTRONOMY, p. 465.

PATHETIC, whatever relates to the paſſions, or that is proper to excite or awake them.

PATHOGNOMONIC, among phyſicians, an appellation for a ſymptom, or concourſe of ſymptoms, that are inſeparable from a diſtemper, and are found in that only, and in no other.

PATHOLOGY, that part of medicine, which explains the nature of diſeaſes, their cauſes and ſymptoms.

PATHOS, a Greek term, literally ſignifying paſſion, is ſometimes uſed for the energy of a diſcourſe, or its power to move the paſſions.

PATMOS, one of the leaſt of the iſlands of the Archipelago, ſubject to the Turks: E. long. 27°, and N. lat. 37°.

PATNA, a city of the hither India, the capital of the territory of the ſame name, in the province of Bengal: E. long 85°, and N. lat. 26°.

PATANCE, in heraldry, is a croſs, flory at the ends; from which it differs only in this, that the ends, inſtead of turning down like a fleur-de-lis, are extended ſomewhat in the pattee-form. See FLORY.

PATOWMAC, a great river of Virginia, which ariſes in the Apalachian mountains, and after ſeparating Virginia from Maryland falls into the bay of Cheſepeak.

PATRAS, a city and port town of European Turky, in the province of the Morea: E. long. 21° 30′, and N. lat. 38° 20′.

PATRES CONSCRIPTI. See CONSCRIPT and SENATOR.

PATRIARCHS, among Chriſtians, are eccleſiaſtical dignitaries, or biſhops, ſo called from their paternal authority in the church. The power of patriarchs was not the ſame in all, but differed according to the different cuſtoms of countries, or the pleaſures of kings and councils: thus the patriarch of Conſtantinople grew to be a patriarch over the patriarchs of Epheſus and Cæſarea, and was called the œcumenical and univerſal patriarch; and the patriarch of Alexandria had ſome prerogatives, which no other patriarch beſides himſelf enjoyed, ſuch as the right of conſecrating and approving every ſingle biſhop under his juriſdiction.

PATRIARCHAL CROSS, in heraldry, is that where the ſhaft is twice croſſed; the lower arms being longer than the upper ones. Plate CXXXIV. fig. 14. is a patriarchal croſs, gules, on a field argen

PATRICIAN, among the ancient Romans, a title given to the deſcendants of the hundred, or, according to others, of the two hundred firſt ſenators choſen by Romulus, and by him called Patres, *Fathers*.

PATRIMONY, a right or eſtate inherited by a perſon from his anceſtors.

PATRINGTON, a market-town of Yorkſhire, ſituated at the mouth of the Humber, fifty miles eaſt of York.

PATRIPASSIANS, in church-hiſtory, a Chriſtian ſect, which appeared about the latter end of the IId century; ſo called from their aſcribing the paſſion to the Father: for they aſſerted the unity of God in ſuch a manner as to deſtroy all diſtinction of perſons, and to make the Father and Son preciſely the ſame; in which they were followed by the Sabellians, and others. The author and head of the patripaſſians was Praxeas, a philoſopher of Phrygia in Aſia.

PATROL, in war, a round or march made by the guards, or watch, in the night-time, to obſerve what paſſes in the ſtreets, and to ſecure the peace and tranquillity of a city or camp.

PATRON, among the Romans, was an appellation given to a maſter who had freed his ſlave. As ſoon as the relation of maſter expired, that of patron began; for the Romans, in giving the ſlaves their freedom, did not deſpoil themſelves of all right and privileges in them; the law ſtill ſubjected them to conſiderable ſervices and duties towards their patrons, the neglect of which was very ſeverely puniſhed.

PATRON, in the church of Rome, a ſaint, whoſe name a perſon bears, or under whoſe protection he is put, and whom he takes particular care to invoke; or a ſaint, in whoſe name a church or order is founded.

PATRON,

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PATRON, in Scots law. See LAW, Tit. v. 5.

PATRONAGE, the right of diſpoſing a church or benefice, and enjoying ſeveral other privileges, ſuch as having the honourable rights of the church, being interred in the chancel, &c.

Arms of PATRONAGE, in heraldry, are thoſe on the top of which are ſome marks of ſubjection and dependance: thus the city of Paris bears the fleurs de-lis in chief, to ſhew her ſubjection to the king; and the cardinals on the top of their arms, bear thoſe of the pope, who gave them the hat, to ſhew that they are his creatures.

PATRONYMIC, among grammarians, is applied to ſuch names of men and women as are derived from thoſe of parents or anceſtors.

PAVETTA, in botany, a genus of the tetrandria monogynia claſs. The corolla conſiſts of one funnel-ſhaped petal; the ſtylus is crooked; and the berry contains one ſeed. There is but one ſpecies, a native of India.

PAVIA, a city of Italy, in the duchy of Milan, capital of the Paveſan, the ſee of a biſhop, and univerſity; ſituated in E. long. 9° 40′, and N. lat. 45° 15′.

PAVIA, in botany. See ÆSCULUS.

PAULIONISTS, in church-hiſtory, Chriſtian heretics of the IIId century, diſciples of Paul Samoſatenſis biſhop of Antioch, who denied Chriſt's divinity, maintaining that when we call him the Son of God, we do not thereby mean that he is really and truly God; but only that he was ſo perfect a man, and ſo ſuperior in virtue to all others, that he had this name given him by way of eminence.

PAULICIANS, Chriſtian heretics of the VIIth century, diſciples of one Conſtantine, a native of Armenia, and a favourer of the errors of Manes; who, as the name Manichees was become odious to all nations, gave thoſe of his ſect the title of Paulicians, on pretence that they followed only the doctrine of St Paul.

PAULINIA, in botany, a genus of the octandria trigynia claſs. The calix conſiſts of four leaves, the corolla of four petals, and the nectarium of four unequal leaves; it has three compreſſed, membranaceous capſules. There are ſeven ſpecies, none of them natives of Britain.

PAVO, in ornithology, a genus belonging to the order of gallinæ. The head is covered with feathers which bend backwards; and the feathers of the tail are very long, and beautifully variegated with eyes of different colours. There are three ſpecies, *viz.* 1. The criſtatus, or common peacock of Engliſh authors, has a compreſſed creſt, and ſolitary ſpurs, and is a native of Ceylon. 2. The bicalcaratus, has a ſmall creſt, and double ſpurs: It is a native of China. 3. The muticus, has a ſharp pointed creſt, and no ſpurs, and the orbits of the eyes are red. It is found in Japan.

PAVO, in aſtronomy. See ASTRONOMY, p. 487.

PAURAEDRASTYLÆ, in natural hiſtory, the name of a genus of perfect cryſtals, with double pyramids, and no intermediate column, compoſed of twelve planes, or two hexangular pyramids, joined baſe to baſe.

PAUSANIA, in Grecian antiquity, a feſtival, in which were ſolemn games, wherein nobody contended but free-born Spartans; in honour of Pauſanias, the Spartan general, under whoſe conduct the Greeks overcame Mardonius, in the famous battle at Platææ.

PAUSE, a ſtop or ceſſation of ſpeaking, ſinging, playing, or the like. The uſe of pointing in grammar, is to make proper pauſes, in certain places. There is a pauſe in the middle of each verſe; in an hemiſtich it is called a reſt or repoſe.

PAW, in the menage. A horſe is ſaid to paw the ground, when his leg, being either tired or painful, he does not reſt it upon the ground, and fears to hurt himſelf as he walks.

PEA, in botany. See PISUM.

PEACH, in botany. See AMYDALUS.

PEACOCK, in ornithology. See PAVO.

PEAK, a rocky mountainous country in the weſt of Derbyſhire, remarkable for its mines of lead and iron, &c.

PEAN, in heraldry, is when the field of a coat of arms is ſable, and the powderings or.

PEAR, in botany. See PYRUS.

PEARCH, in ichthyology. See PERCA.

PEARCH-GLUE, the name of a kind of glue of remarkable ſtrength and purity, made from the ſkins of pearches.

PEARL, in natural hiſtory, a hard, white, ſhining body, uſually roundiſh, found in a teſtaceous fiſh reſembling an oyſter.

Pearls, though eſteemed of the number of gems by our jewellers, and highly valued, not only at this time, but in all ages, proceed only from a diſtemper in the creature that produces them, analogous to the bezoars, and other ſtony concretions in ſeveral animals of other kinds.

The fiſh in which theſe are uſually produced is the Eaſt-Indian pearl-oyſter, as it is commonly called. Beſides this ſhell, there are many others that are found to produce pearls; as the common oyſter, the muſcle, and ſeveral others; the pearls of which are often very good; but thoſe of the true Indian berberi, or pearl-oyſter, are in general ſuperior to all. The ſmall or ſeed-pearls, alſo called ounce-pearls, from their being ſold by the ounce, and not by tale, are vaſtly the moſt numerous and common; but as in diamonds, among the multitudes of ſmall ones, there are ſmaller numbers of larger found, ſo in pearls there are larger and larger kinds; but as they increaſe in ſize, they are proportionably leſs frequent, and this is one reaſon of their great price. We have Scotch pearls frequently as big as a little tare, ſome as big as a large pea, and ſome few of the ſize of a horſe-bean; but theſe are uſually of a bad ſhape, and of little value in proportion to their weight. Philip II. of Spain, had a pearl perfect in its ſhape and colour, and of the ſize of a pigeon's egg. The fineſt, and what is called the true ſhape of the pearl, is a perfect round; but if pearls of a conſiderable ſize are of the ſhape of a pear, as is not unfrequently the caſe, they are not leſs valued, as they ſerve for ear-rings and other ornaments. Their colour ought to be a pure white, and that not a dead and lifeleſs but a clear and brilliant one; they muſt be perfectly free from any foulneſs, ſpot or ſtain; and their ſurfaces muſt be naturally ſmooth and gloſſy, for they bring their natural poliſh with them, which art is not able to improve.

All pearls are formed of the matter of the ſhell, and conſiſt of a number of coats ſpread with perfect regularity one over another, in the manner of the ſeveral coats of an onion, or like the ſeveral ſtrata of the ſtones found in the bladders or ſtomachs of animals, only much thinner.

Manner of fiſhing for PEARLS *in the Eaſt-Indies.* There are two ſeaſons for pearl-fiſhing: the firſt is in March and April,

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April, and the laſt in Auguſt and September; and the more rain there falls in the year, the more plentiful are theſe fiſheries. At the beginning of the ſeaſon there are ſometimes two hundred and fifty barks on the banks; the larger barks having two divers, and the ſmaller one. As ſoon as the barks arrive at the place where the fiſh lie, and have caſt anchor, each diver binds a ſtone ſix inches thick, and a foot long, under his body; which ſerves him as ballaſt, prevents his being driven away by the motion of the water, and enables him to walk more ſteadily under the waves. They alſo tie another very heavy ſtone to one foot, by which they are very ſpeedily ſent to the bottom of the ſea: and as the oyſters are uſually firmly faſtened to the rocks, they arm their hands with leather mittens to prevent their being wounded in pulling them violently off; but this taſk ſome perform with an iron-rake. In the laſt place, each diver carries down with him a large net in the manner of a ſack, tied to his neck by a long cord, the other end of which is faſtened to the ſide of the bark. This net is to hold the oyſters gathered from the rock, and the cord is to pull up the diver when his bag is full or he wants air.

In this equipage he ſometimes precipitates himſelf ſixty feet under water; and as he has no time to loſe, he no ſooner arrives at the bottom, than he begins to run from ſide to ſide tearing up all the oyſters he meets with, and cramming them into his budget.

At whatever depth the divers are, the light is ſo great, that they eaſily ſee whatever paſſes in the ſea: and to their great conſternation ſometimes perceive monſtrous fiſhes, from which all their addreſs in mudding the water, *&c.* will not always ſave them, but they unhappily become their prey: and of all the dangers of the fiſhery, this is one of the greateſt and moſt uſual. The beſt divers will keep under water near half an hour, and the reſt do not ſtay leſs than a quarter. During this time they hold their breath without the uſe of oils, or any other liquors; only acquiring the habit by long practice. When they find themſelves ſtraightened, they pull the rope to which the bag is faſtened, and hold faſt by it with both hands; when thoſe in the bark, taking the ſignal, heave them up into the air, and unload them of their fiſh, which is ſometimes five hundred oyſters, and ſometimes not above fifty. Some of the divers need a moment's reſpite to recover breath; others jump in again inſtantly, continuing this violent exerciſe without intermiſſion for ſeveral hours.

On the ſhore they unload their barks, and lay their oyſters in an infinite number of little pits dug in the ſand four or five feet ſquare; raiſing heaps of ſand over them to the height of a man; and in this condition they are left, till the rain, wind, and ſun have obliged them to open, which ſoon kills them: upon this the fleſh rots and dries, and the pearls, thus diſengaged, fall into the pit, on their taking out the ſhells. After clearing the pits of the groſſer filth, they ſift the ſand ſeveral times in order to find the pearl: but whatever care they take, they always loſe a great many. After cleaning and drying the pearls, they are paſſed through a kind of ſieve, according to their ſizes; the ſmalleſt are then ſold as ſeed-pearls, and the reſt put up to auction, and ſold to the higheſt bidder.

Artificial PEARLS, are made by reducing ſeed-pearls to a paſte, by means of a chemical preparation called mercurial water, making the beads in ſilver-moulds, boring them with a hog's briſtle, and drying them in a cloſed glaſs in the ſun.

Beads, in imitation of pearls, are alſo made of wax, and covered with the ſcales of ſeveral kinds of fiſhes.

Mother of PEARL, is the ſhell, not of the pearl-oyſter, but of another ſea-fiſh of the oyſter-kind. This ſhell on the inſide is extremely ſmooth, and of the whiteneſs and water of pearl itſelf; and it has the ſame luſtre on the outſide, after the firſt laminæ or ſcales have been cleared off with aquafortis and the lapidaries mill. Mother of pearl is uſed in inlaid works, and in ſeveral toys, as ſnuff-boxes, *&c.*

PEARL-ISLANDS, ſeveral ſmall iſlands ſituated in the bay of Panama; W. long. 81°, and between 7° and 9° of north lat.

PEAT, a kind of turf uſed for fuel in ſeveral countries.

PEBBLES, the name of a genus of foſſils, diſtinguiſhed from the flints and homochroa by their having a variety of colours. Theſe are defined to be ſtones, compoſed of a cryſtalline matter, debaſed by earths of various kinds in the ſame ſpecies, and then ſubject to veins, clouds, and other variegations; uſually formed by incruſtations round a central nucleus, but ſometimes the effect of a ſimple concretion, and veined like the agates, by the diſpoſition the motion of the fluid they were formed in gave their differently coloured ſubſtances.

PECCANT, in medicine, a term uſed for thoſe humours of the body which offend either by their quantity or quality.

PECK, a meaſure of capacity, four of which make a buſhel.

PECORA, in natural hiſtory, the name of a claſs of quadrupeds. See NATURAL HISTORY.

PECTORAL, an epithet for medicines good for diſorders of the breaſt and lungs.

PECTORALIS, in anatomy. See ANATOMY, p. 194, 195.

PECTORIS os, in anatomy. See ANATOMY, p. 175.

PECULIUM, the ſtock or eſtate which a perſon in the power of another, as a ſlave, may acquire by his induſtry.

PEDAGOGUE, a tutor or maſter, to whom is committed the diſcipline and direction of a ſcholar.

PEDANT, is uſed for a rough unpoliſhed man of letters, who makes an impertinent uſe of the ſciences, and abounds in unſeaſonable criticiſms and obſervations.

PEDARIAN, in Roman antiquity, thoſe ſenators who ſignified their votes by their feet, not their tongues; that is, ſuch as walked over to the ſide of thoſe whoſe opinion they approved of, in diviſions of the houſe.

PEDESTAL, in architecture. See ARCHITECTURE, p. 356.

PEDICLE, among botaniſts, that part of a ſtalk which immediately ſuſtains the leaf of a flower or a fruit, and is commonly called a foot-ſtalk.

PEDICULARIS, in botany, a genus of the didynamia angioſpermia claſs. The calix conſiſts of five ſegments; the capſule is ſharp-pointed, oblique, and has two cells; and the ſeeds are covered with a tunic. There are 14 ſpecies, two of which are natives of Britain, *viz.* the ſylvatica, or common louſe-wort; and the paluſtris, or marſh louſe-wort.

This plant is of a cooling and drying nature, whence it

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it is recommended in fiſtulas and other ſinous ulcers.

PEDICULUS, LOUSE, in zoology, a genus of inſects belonging to the order of aptera. It has ſix feet, two eyes, and a ſort of ſting in the mouth; the feelers are as long as the thorax; and the belly is depreſſed, and ſublobated. There are 40 ſpecies, denominated from the different creatures they inhabit. The beſt antidote againſt this kind of vermin, is cleanlineſs.

PEDILUVIUM, a bathing of the feet. This bath may be prepared of the ſame ingredients with other baths. It may either conſiſt of light pure water alone; or, to correct the qualities of heavy and hard water, a lixivium or bran of wheat or chamomile-flowers may be added.

PEDIMENT, in architecture. See ARCHITECTURE, p. 356.

PEDIR, a town in the iſland of Sumatra, in the Eaſt-Indies, ſituated in E. long 94° lat. 5°.

PEDUNCLE, among botaniſts. See PEDICLE.

PEDUNCULI CEREBELLI, in anatomy. See ANATOMY, p. 287.

PEEBLES, a town of Scotland, capital of the ſhire of Tweedale, ſituated on the river Tweed, twenty-two miles ſouth of Edinburgh.

PEEK, in the ſea-language, is a word uſed in various ſenſes. Thus the anchor is ſaid to be a-peek, when the ſhip being about to weigh comes over her anchor in ſuch a manner that the cable hangs perpendicularly betwixt the hauſe and the anchor. To heave a peek is to bring the peek ſo as that the anchor may hang a-peek.

PEER, in general, ſignifies an equal, or one of the ſame rank and ſtation.

The term peer is now applied to thoſe who are impannelled in an inqueſt upon a perſon for convicting or acquitting him of any offence laid to his charge; and the reaſon why the jury is ſo called, is, becauſe by the common law, and the cuſtom of this kingdom, every perſon is to be tried by his peers or equals, a lord by the lords, and a commoner by commoners.

PEER *of the realm*, a noble lord who has a ſeat and vote in the houſe of lords, which is alſo called the houſe of peers. Theſe lords are called peers, becauſe, though there is a diſtinction of degrees in our nobility, yet in public actions they are equal, as in their votes in parliament, and in trying any nobleman or other perſon impeached by the commons, *&c.* See PARLIAMENT.

PEERS *of France*, the twelve great lords of that kingdom, of which ſix are dukes, and ſix counts; and of theſe, ſix are eccleſiaſtics, and ſix laymen: thus, the archbiſhop of Rheims, and the biſhop of Laon and Langres are dukes and peers; and the biſhops of Chalon on the Marn, Noyons, and Beauvais, are counts and peers. The dukes of Burgundy, Normandy, and Aquitain, are lay peers and dukes; and the counts of Flanders, Champaign, and Toloufe, lay peers and counts. Theſe peers ſtill aſſiſt at the coronation of kings, either in perſon or by their repreſentatives, where each performs the functions attached to his reſpective dignity: but as the ſix lay peerages are all at preſent united to the crown except that of the count of Flanders, ſix lords of the firſt quality are choſen to repreſent them; but the eccleſiaſtical peers uſually aſſiſt in perſon. At preſent the title of peer is beſtowed on every lord whoſe eſtate is erected into a peerage, the number of which is uncertain, and it depends entirely on the king.

PEERESS, a woman who is noble by deſcent, creation, or marriage.

If a peereſs, by deſcent or creation, marries a perſon under the degree of nobility, ſhe ſtill continues noble; but if ſhe obtains that dignity only by marriage, ſhe loſes it on her afterwards marrying a commoner; yet, by the curteſy of England, ſhe always retains the title of her nobility.

PEEVIT, in ornithology. See LARUS.

PEGANUM, in botany, a genus of the dodecandria monogynia claſs. The corolla conſiſts of five petals, and the calix of five leaves; the capſule has three cells, and three valves, containing many ſeeds. There are two ſpecies, none of them natives of Britain.

PEGASUS, in aſtronomy. See ASTRONOMY, p. 487.

PEGU, the capital of the kingdom of Pegu, and ſituated upon a river of the ſame name, in 97° E. long. and N. lat. 17° 30′.

PEKIN, the metropolis of the empire of China, is ſituated in E. long. 111°, and N. lat. 40°.

It is about twenty miles in circumference, and is ſaid to contain 2,000,000 of people.

PELAGIANS, a Chriſtian ſect who appeared about the latter end of the fourth, or the beginning of the fifth century.

Pelagius, the author of this ſect, was born in Wales, and his name was Morgan, which in the Welſh language ſignifies ſea-born; from whence he had his Latin name Pelagius. Some of our ancient hiſtorians pretend that he was abbot of Bangor: but this is impoſſible, becauſe the Britiſh monaſteries were of a later date. St Auſtin gives him the character of a very pious man, and a Chriſtian of no vulgar rank: according to the ſame father, he travelled to Rome, where he aſſociated himſelf with perſons of the greateſt learning and figure, and wrote his commentaries on St Paul's Epiſtles, and his letters to Melania and Demetrias; but being charged with hereſy, he left Rome, and went into Africa, and from thence to Jeruſalem, where he ſettled. He died ſomewhere in the eaſt; but where, is uncertain. He was charged with maintaining the following doctrines: 1. That Adam was by nature mortal, and, whether he had ſinned or not, would certainly have died. 2. That the conſequences of Adam's ſin were confined to his own perſon. 3. That newborn infants are in the ſame condition with Adam before the fall. 4. That the law qualified men for the kingdom of heaven, and was founded upon equal promiſes with the goſpel. 5. That the general reſurrection of the dead does not follow in virtue of our Saviour's reſurrection. 6. That the grace of God is given according to our merits. 7. That this grace is not granted for the performance of every moral act; the liberty of the will, and information in points of duty being ſufficient, *&c.*

PELICANUS, in ornithology, a genus belonging to the order of anſeres. The bill is ſtrait, without teeth, and crooked at the point; the face is naked; and the feet are palmated. There are eight ſpecies, principally diſtinguiſhed by the ſhape of their tails.

PELICAN, in ornithology. See PELICANUS.

PELICAN, in chemiſtry. See CHEMISTRY, p. 109.

PELLETS,

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PELLETS, in heraldry, thoſe roundles that are black, called alſo ogreſſes and gunſtones, and by the French torteaux de ſable.

PELLICLE, among phyſicians, *&c.* denotes a thin film, or fragment of a membrane.

PELVIS, in anatomy. See ANATOMY, p. 173.

PEMBROKE, the capital of Pembrokeſhire, in ſouth Wales: W. long. 5°, N. lat. 51° 45′. This town ſends two members to parliament.

PENAL *action*, in Scots law. See LAW, Tit. xxx. 17.

PENANCE, a puniſhment, either voluntary, or impoſed by authority, for the faults a perſon has committed. Penance is one of the ſeven ſacraments of the Romiſh church. Beſides faſting, alms, abſtinence, and the like, which are the general conditions of penance; there are others of a more particular kind, as the repeating a certain number of ave-marys, pater-noſters, and credos, wearing a hair-ſhirt, and giving one's ſelf a certain number of ſtripes In Italy and Spain it is uſual to ſee Chriſtians almoſt naked, loaded with chains and a croſs, and laſhing themſelves at every ſtep.

PENÆA, in botany, a plant of the tetrandria monogynia claſs. The calix conſiſts of two leaves; the corolla is bell ſhaped; the ſtylus is quadrangular; and the capſule is triangular, with four cells containing eight ſeeds. There are three ſpecies, none of them natives of Britain.

PENATES, in Roman antiquity, a kind of tutelar deites, either of countries or particular houſes; in which laſt ſenſe, they differed in nothing from the lares. See LARES.

PENCIL, an inſtrument uſed by painters for laying on their colours. Pencils are of various kinds, and made of various materials; the larger ſorts are made of boars briſtles, the thick ends of which are bound to a ſtick, bigger or leſs according to the uſes they are deſigned for: theſe, when large, are called bruſhes. The finer ſorts of pencils are made of camels, badgers, and ſquirrels-hair, and of the down of ſwans; theſe are tied at the upper end with a piece of ſtrong thread, and incloſed in the barrel of a quill.

PENDANT, an ornament hanging at the ear, frequently conſiſting of diamonds, pearls, and other precious ſtones.

PENDANTS, in heraldry, parts hanging down from the label, to the number of three, four, five, or ſix at moſt, reſembling the drops in the Doric frieze. When they are more than three, they muſt be ſpecified in blazoning.

PENDANTS of a ſhip, are thoſe ſtreamers or long colours which are ſplit and divided into two parts ending in points, and hung at the head of maſts, or at the yard-arm ends.

PENDULOUS, a term applied to any thing that bends or hangs downwards.

PENDULUM, in mechanics, denotes any heavy body, ſo ſuſpended as that it may vibrate or ſwing, backwards and forwards, about ſome fixed point, by the force of gravity. See MECHANICS.

PENETRALE, in Roman antiquity, properly denoted the chapel conſecrated to the penates, or houſhold-gods.

PENGUIN ISLAND and BAY, are ſituated on the coaſt of Patagonia in South America: W. long. 70°, S. lat 47°.

PENGUIN, in ornithology. See ALCA.

PENICHE, a port-town of Portugal, in the province of Eſtremadura, ſituated on the Ocean, forty miles north of Liſbon: W. long. 9° 6′, N. lat. 39° 20′.

PENICILLUS, among ſurgeons, is uſed for a tent to be put into wounds or ulcers.

PENINSULA, in geography, a portion or extent of land, joining to the continent by a narrow neck or iſthmus, the reſt being encompaſſed with water.

PENIS, in anatomy. See ANATOMY, p. 270.

PENISCOLA, a port-town of Spain, in the province of Valencia, ſituated on the Mediterranean, under the meridian of London, and in N. lat. 40° 29′.

PENNY, an ancient ſilver-coin, which, though now little uſed, was the only one current among our Saxon anceſtors.

PENNY-EARTH, in agriculture, denotes a hard, loamy, or ſandy earth, with a large proportion of ſea-ſhells intermixed with it.

PENNY-WEIGHT, a troy-weight, containing twenty-four grains, each of which is equal in weight to a grain of wheat, gathered out of the middle of the ear, and well dried.

PENRISE, a port-town of Wales, in the county of Glamorgan, ſituated on Briſtol channel, ſeventeen miles ſouth of Caermarthen.

PENRYN a borough-town of Cornwal, near a bay of the Engliſh channel: W. long. 5° 35′, N. lat. 50° 20′. It ſends two members to parliament.

PENSANCE, a market-town of Cornwal, eight miles eaſt of the Land's end.

PENSILVANIA, one of the Engliſh plantations in America, two hundred miles in length, and almoſt as much in breadth: ſituated between 74 and 78° of weſt longitude, and between 39 and 42° of north latitude: a fine fruitful country, bounded by the five nations of the Iroquois on the north, by New-Jerſey and New-York on the eaſt, and by Maryland on the ſouth and weſt. It is a proprietary government, the heirs of Mr. Penn, a quaker, who ſettled this country, appointing the governor.

PENSION, a ſum of money paid annually for ſervices or conſiderations already paſt. The yearly payment of each member to the houſes of the inns of courts, are likewiſe termed penſions; and the yearly aſſembly of the members of the ſociety of Gray's Inn, to conſult on the affairs of the houſe, is alſo called a penſion.

PENSIONER, in general, denotes a perſon who receives a penſion, yearly ſalary, or allowance. Hence,

The band of gentleman-penſioners, the nobleſt ſort of guard to the king's perſon, conſiſts of forty gentlemen, who receive a yearly penſion of one hundred pounds. This honourable band was firſt inſtituted by king Henry VIII. and their office is to attend the king's perſon, with their battle-axes, to and from his chapel-royal, and to receive him in the preſence chamber, or coming out of his privy-lodgings; they are alſo told to attend at all great ſolemnities, as coronations, St. George's feaſt, public audiences of ambaſſadors, at the ſovereign's going to parliament, *&c.*

They are each obliged to keep three double horſes and a ſervant, and ſo are properly a troop of horſe. They wait half at a time, quarterly; but on Chriſtmas-day, Eaſter-day, Whitſunday, *&c.* and on extraordinary occaſions, they are all obliged to give their attendance.

PENTACROSTIC, in poetry, a ſet of verſes ſo diſpoſed as that there are always five acroſtics of the ſame name, in five diviſions of each verſe.

PENTAEDROSTYLA, in natural hiſtory, the name of a genus of ſpars. See SPAR.

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The bodies of this genus are ſpars, in form of pentangular columns, terminated by pentangular pyramids at one end, and irregularly affixed at the other to ſome ſolid body.

PENTAGON, in geometry, a figure of five ſides and five angles. See GEOMETRY.

PENTAGRAPH, an inſtrument whereby deſigns of any kind may be copied in what proportion you pleaſe, without being ſkilled in drawing.

PENTAMETER, in ancient poetry, a kind of verſe conſiſting of five feet, or metres; whence the name.

The two firſt feet may be either dactyls or ſpondees, at pleaſure; the third is always a ſpondee, and the two laſt anapeſts.

PENTANDRIA, in botany. See BOTANY, p. 635.

PENTAPETALOUS, an appellation given to flowers that conſiſt of five petals or leaves.

PENTAPETES, in botany, a genus of the monodelphia decandria claſs. The calix is ſimple; the capſule has five cells, containing many membranaceous ſeeds. There are three ſpecies, none of them natives of Britain.

PENTASTYLE, in architecture, a building wherein there are five rows of columns.

PENTATEUGH, an appellation given to the firſt five books of the Old Teſtament, *viz.* Geneſis, Exodus, Leviticus, Numbers, and Deuteronomy, *&c.*

PENTATHLON, in antiquity, a general name for the five exerciſes performed at the Grecian games, *viz.* wreſtling, boxing, leaping, running, and playing at the diſcus.

PENTECOST, a ſolemn feſtival of the Jews, ſo called becauſe it was celebrated on the fiftieth day after the ſixteenth of the month Niſan, which was the ſecond day of the paſſover. See PASSOVER.

The feaſt of pentecoſt was inſtituted in memory of the Law's being given on the fiftieth day after the Iſraelites came out of Egypt.

PENTHORUM, in botany, a genus of the decandria pentagynia claſs. The calix conſiſts of five ſegments; the petals are from five to nine; and the capſule has five cells. There is but one ſpecies, *viz.* the ſedoides, a native of Virginia.

PENULTIMA, or PENULTIMATE SYLLABLE, in grammar, denotes the laſt ſyllable but one of a word, and hence the anti-penultimate ſyllable is the laſt but two, or that immediately before the penultima.

PENUMBRA, in aſtronomy, a partial ſhade obſerved between the perfect ſhadow and the full light in an eclipſe.

It ariſes from the magnitude of the ſun's body; for were he only a luminous point, the ſhadow would be all perfect; but by reaſon of the diameter of the ſun, it happens that a place which is not illuminated by the whole body of the ſun does yet receive rays from a part thereof.

PEPLIS, in botany, a genus of the hexandria monogynia claſs. The perianthium is bell-ſhaped, with twelve ſegments; the petals are ſix, inſerted into the calix; and the capſule has two cells. There are two ſpecies, none of them natives of Britain.

PEPO, in botany. See CUCURBITA.

PEPPER, in botany, See PIPER.

PEPPER-MINT. See MENTHA.

PERA, one of the ſuburbs of Conſtantinople, where ambaſſadors and Chriſtians uſually reſide.

PERAMBULATOR, in ſurveying, an inſtrument for meaſuring diſtances, called alſo pedometer, way-wiſer, and ſurveying wheel.

It conſiſts of a wheel AA (Plate CXXXIV. fig. 15. n° 1.) two feet ſeven inches and a half in diameter; conſequently half a pole, or eight feet three inches, in circumference. On one end of the axis is a nut, three quarters of an inch in diameter, and divided into eight teeth; which, upon moving the wheel round, fall into the eight teeth of another nut *c* (*ibid.* n° 2.) fixed on one end of an iron-rod Q, and thus turn the rod once round in the time the wheel makes one revolution. This rod, lying along a groove in the ſide of the carriage of the inſtrument, under the dotted line, has at its other end a ſquare hole, into which is fitted the end *b* of a ſmall cylinder P. This cylinder is diſpoſed (*ibid* n° 3.) under the dial-plate of a movement, at the end of the carriage B, in ſuch a manner as to be moveable about its axis: its end *a* is cut into a perpetual ſcrew, which falling into the thirty-two teeth of a wheel perpendicular thereto, upon driving the inſtrument forward, that wheel makes a revolution each ſixteenth pole. On the axis of this wheel is a pinion with ſix teeth, which, falling into the teeth of another wheel of ſixty teeth, carries it round every hundred and ſixtieth pole, or half a mile.

This laſt wheel, carrying a hand or index round with it over the diviſions of a dial-plate, whoſe outer limb is divided into one hundred and ſixty parts, correſponding to the one hundred and ſixty poles, points out the number of poles paſſed over. Again, on the axis of this laſt wheel is a pinion, containing twenty teeth, which falling into the teeth of a third wheel which hath forty teeth, drives it once round in three hundred and twenty poles, or a mile. On the axis of this wheel is a pinion of twelve teeth, which, falling into the teeth of a fourth wheel having ſeventy-two teeth, drives it once round in twelve miles.

This fourth wheel, carrying another index over the inner limb of the dial-plate, divided into twelve for miles, and each mile ſubdivided into halves, quarters, and furlongs, ſerves to regiſter the revolutions of the other hand, and to keep account of the half miles and miles paſſed over as far as twelve miles.

The uſe of this inſtrument is obvious from its conſtruction. Its proper office is in the ſurveying of roads and large diſtances, where a great deal of expedition, and not much accuracy, is required. It is evident, that driving it along, and obſerving the hands, has the ſame effect as dragging the chain, and taking account of the chains and links.

Its advantages are its handineſs and expedition; its contrivance is ſuch, that it may be fitted to the wheel of a coach, in which ſtate it performs its office, and meaſures the road without any trouble at all.

PERCA, the PEARCH, in ichthyology, a genus belonging to the order of thoracici. The head is furniſhed with ſcaly and ſerrated opercula; there are ſeven rays in the membrane of the gills; and the fins on the back are prickly. There are 38 ſpecies, principally diſtinguiſhed by peculiarities in the back-fins.

PERCEPTION, in logic, the firſt and moſt ſimple act of the mind, whereby it perceives or is conſcious of its ideas. See LOGIC.

PERCH. See PERCA.

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PERCOLATION. See FILTRATION.

PERCUSSION, in mechanics, the impreſſion a body makes in falling or ſtriking upon another, or the ſhock of two bodies in motion.

PERDIX See TETRAO.

PERENNIAL, in botany, is applied to thoſe plants whoſe roots will abide many years, whether they retain their leaves in winter or not: thoſe which retain their leaves are called evergreens; but ſuch as caſt their leaves, are called deciduous, or perdifols.

PERFORANS MANUS, in anatomy. See ANATOMY, p. 201.

PERFORANS PEDIS, in anatomy. See ANATOMY, p. 211.

PERFORATUS MANUS, in anatomy. See ANATOMY, p. 201.

PERFORATUS PEDIS, in anatomy. See ANATOMY, p. 211.

PERFUME, an agreeable odour, affecting the organ of ſmelling. The generality of perfumes are made up of muſk, ambergreaſe, civet, roſe and cedar-woods, orange-flowers, jaſmin, jonquils, tuberoſes, and other odoriferous flowers. Thoſe drugs commonly called aromatics, ſuch as ſtorax, frankincenſe, benzoin, cloves, mace, &c. enter the compoſition of a perfume: ſome are alſo compoſed of aromatic herbs or leaves, as lavender, marjoram, ſage, thyme, hyſſop, &c.

Perfumes were anciently very much in uſe: but ſince people are become ſenſible of the harm they do to the head, they are generally diſuſed among us; however, they are ſtill common in Spain and Italy.

PERGA, a port-town of European Turkey, in the province of Albina, oppoſite to the iſland of Corfu, in E. long. 21°, N. lat. 39° 20′.

PERGAMUS, an ancient city of the leſſer Aſia, in the province of Phrygia, ſituated north of Symrna.

PERIAGOGE, in rhetoric, is uſed where many things are accumulated into one period which might have been divided into ſeveral.

PERIANTHIUM, in botany. See BOTANY, p 637.

PERICARDIUM, in anatomy. See ANATOMY, p. 279.

PERICARPIUM, among botaniſts. See BOTANY, p. 637.

PERICHORUS, in antiquity, a name given by the Greeks to their profane games and combats, that is, to ſuch as were not conſecrated to any of the gods.

PERICRANIUM, in anatomy. See ANATOMY, p 288.

PERIGEE, in aſtronomy, that point of the ſun's or moon's orbit wherein they are at their leaſt diſtance from the earth, in which ſenſe it ſtands oppoſed to apogee.

PERIGRAPHE, a word uſually underſtood to expreſs a careleſs or inaccurate delineation of any thing; but in Veſalius it is uſed to expreſs the white lines or impreſſions that appear in the muſculus rectus of the abdomen.

PERIGUEUX, a city of France, in the province of Guienne, capital of the territory of Perigord, ſituated on the river Liſle: in E. long. 25′, N. lat. 45° 15′.

PERIHELIUM, in aſtronomy, that point of a planet's or comet's orbit, wherein it is in its leaſt diſtance from the ſun; in which ſenſe it ſtands in oppoſition to aphelium.

PERIMETER, in geometry, the bonds or limits of any figure or body.

PERINÆUM, or PERINEUM, in anatomy, the ſpace between the anus and the parts of generation, divided into two equal lateral diviſions, by a very diſtinct line, which is longer in males than in females.

PERIOD, in aſtronomy, the time taken up by a ſtar or planet in making a revolution round the ſun; or the duration of its courſe till it return to the ſame point of its orbit. See ASTRONOMY.

PERIOD, in grammar, denotes a ſmall compaſs of diſcourſe, containing a perfect ſentence, and diſtinguiſhed at the end by a point, or full ſtop, thus (.); and its members or diviſions marked by commas, colons, &c.

PERIODIC, or PERIODICAL, ſomething that terminates and comprehends a period; ſuch is a periodic month, being the ſpace of time wherein the moon diſpatches her period.

PERIOECI, in geograpy, ſuch inhabitants of the earth, as have the ſame latitudes, but oppoſite longitudes; or live under the ſame parallel, and the ſame meridian, but in different ſemicircles of that meridian, or in oppoſite points of the parallel.

PERIOPHTHALMIUM, in natural hiſtory. See NICTITATING MEMBRANE.

PERIOSTEUM, in anatomy. See ANATOMY, p. 145.

PERIPATETIC PHILOSOPHY, that ſyſtem taught and eſtabliſhed by Ariſtotle, and maintained by his followers the peripatetics, called alſo Ariſtotelians.

PERIPETIA, in the drama, that part of a tragedy wherein the action is turned, the plot unravelled, and the whole concludes.

PERIPHERY, in geometry, the circumference of a circle, ellipſes, or any other regular curvilinear figure.

PERIPLOCA, in botany, a genus of the pentandria digynia claſs. The nectarium ſurrounds the inſide of the flower, and includes the filaments and ſtyli. There are four ſpecies, none of them natives of Britain.

PERIPNEUMONY, in medicine. See MEDICINE, p. 91.

PERISCII, in geography, the inhabitants of either frigid zone, between the polar circles and the poles; where the ſun, when in the ſummer-ſigns, moves only round about them, without ſetting, and conſequeatly their ſhadows, in the ſame day, turn to all the points of the horizon.

PERISTALTIC, a vermicular ſpontaneous motion of the inteſtines, performed by the contraction of the circular and longitudinal fibres, of which the fleſhy coats of the inteſtines is compoſed; by means whereof the chyle is driven into the orifices of the lacteal veins, and the fæces are protruded towards the anus.

PERISTAPHYLINUS, in anatomy. See ANATOMY, p. 303.

PERISTYLE, in ancient architecture, a building encompaſſed with a row of columns on the inſide.

PERISYSTOLE, the interval of reſt between the two motions of the heart, *viz.* that of the ſyſtole or contraction, and that of the diaſtole or dilation.

PERITONÆUM, in anatomy. See ANATOMY, p. 257.

PERITROCHIUM, in mechanics, denotes a wheel, or circle, concentric with the baſe of a cylinder, and moveable together with it about an axis. See MECHANICS.

PERJURY, in law, the crime of ſwearing falſely, where a lawful oath is adminiſtered by one in authority, in a matter relating to the iſſue or cauſe in queſtion, whether it be a perſon's own wilful act, or done by the ſubornation of others.

At the common law, perjury, and the ſubornation of it,

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it, are punishable by fine, imprisonment, pillory, transportation, &c. See LAW, Tit. xxxiii. 34.

PERMEABLE, a term applied to bodies of so loose and porous a structure, as to let something pass through them.

PERMUTATION, in commerce, the same with bartering. See COMMERCE.

PERNAMBUCO, a province of Brasil, in America, bounded by the province of Tamera on the north, by the Atlantic ocean on the east, by the province of Seregippa on the south, and by the country of the Tapuyers on the west; being two hundred miles long, and one hundred and fifty broad.

PERONÆUS, in anatomy. See ANATOMY, p. 209.

PERORATION, in rhetoric, the epilogue, or last part of an oration, wherein what the orator had insisted on through his whole discourse, is urged afresh with greater vehemence and passion.

PEROUSA, a town of Italy, in the province of Piedmont, capital of one of the valleys of the Vaudois, situated twelve miles south-west of Turin.

PERPENDICULAR, in geometry, a line falling directly on another line, so as to make equal angles on each side. See GEOMETRY.

PERPETUAL MOTION. See MOVEMENT.

PERPIGNAN, a city of Spain, in the province of Catalonia, capital of the territory of Roussillon, situated on the river Latet: in E long. 2° 35′, N. lat. 43°.

PERRUKE, or PERRIWIG, was anciently used for a head of long natural hair, particularly such as was curled and adjusted with great care. But it is now used for a set of borrowed hair, curled, baked, interwoven between four threads, and sewed together on a cawl.

PERRY, a drink made of pears, in the same manner as cyder is made from apples. See CYDER.

PERSECUTION, is any pain or affliction which a person designedly inflicts upon another; and, in a more restrained sense, the sufferings of Christians on account of their religion.

Historians usually reckon ten general persecutions; the first of which was under the emperor Nero, thirty one years after our Lord's ascension; when that emperor having set fire to the city of Rome, threw the odium of that execrable action on the Christians, who under that pretence were wrapped up in the skins of wild beasts, and worried and devoured by dogs; others were crucified, and others burnt alive. The second was under Domitian, in the year 95. In this persecution St John the apostle was sent to the isle of Patmos, in order to be employed in digging in the mines. The third began in the third year of Trajan, in the year 100, and was carried on with great violence for several years. The fourth was under Antoninus the philosopher, when the Christians were banished from their houses, forbidden to shew their heads, reproached, beaten, hurried from place to place, plundered, imprisoned, and stoned. The fifth began in the year 197, under the emperor Severus. The sixth, began with the reign of the emperor Maximinus, in 235. The seventh, which was the most dreadful persecution that ever had been known in the church, began in the year 250, in the reign of the emperor Decius, when the Christians were in all places driven from their habitations, stripped of their estates, tormented with racks, &c. The eighth began in the year 257, in the fourth year of the reign of the emperor Valerian. The ninth was under the emperor Aurelian A. D. 274, but this was very inconsiderable: and the tenth began in the nineteenth year of Diocletian, A. D. 303. In this dreadful persecution, which lasted ten years, houses filled with Christians were set on fire; and whole droves were tied together with ropes, and thrown into the sea.

PERSEPOLIS, formerly a city of Persia, but now in ruins. Here are the most magnificent remains of a palace, or temple, that are now in being on the face of the earth: E. long. 54°, N. lat. 30° 30′.

PERSEUS, in astronomy. See ASTRONOMY, p. 486.

PERSIA, a large kingdom of Asia, 1200 miles long, and almost as much broad; situated between 45 and 67° of E. long. and between 25° and 45° of N. lat. bounded by Circassian Tartary, the Caspian Sea, and the river Oxus, on the north; by India, on the east; by the Indian Ocean, and the gulphs of Ormus and Persia, on the south; and by the Turkish empire on the west.

PERSICA, in botany. See AMYGDALUS.

PERSICARIA, in botany. See POLYGONUM.

PERSON, an individual substance of a rational or intelligent nature. Thus we say, an ambassador represents the person of his prince; and that, in law, the father and son are reputed the same person.

PERSON, in grammar, a term applied to such nouns or pronouns, as, being either prefixed or understood, are the nominatives in all inflections of a verb; or it is the agent or patient in all finite and personal verbs. See GRAMMAR.

PERSONAL RIGHT, in Scots law. See LAW, Tit. xx. 1.

PERSONAL VERB, in grammar, a verb conjugated in all the three persons; thus called, in opposition to an impersonal verb, or that which has the third person only.

PERSONALITY, in the schools, that which constitutes an individual or distinct person.

PERSONIFYING, the giving an inanimate being the figure, sentiments, and language of a person.

Personifying is essential to poetry, especially to the epopœia: the poets have therefore personified all the passions, and even represented them as deities; as the goddess Persuasion, the god Sleep; the Furies, Envy, Discord, and Fame, Fortune, Victory, Sin, Death, &c.

PERSPECTIVE.

PERSPECTIVE teaches how to represent objects on a plane superficies, such as they would appear at a certain distance and height, upon a transparent plane perpendicular to the horizon, placed between the objects and the eye.

In order to understand this subject, a general knowledge of the principles of Optics is absolutely necessary. The foundation

dation of perſpective may be underſtood by ſuppoſing the pantagon ABDEF (Plate CXLIII. fig. 1.) were to be repreſented by the rules of perſpective on the tranſparent plane VP placed perpendicularly on the horizontal plane HR; dotted lines are imagined to paſs from the eye C to each point of the pentagon, as CA, CB, CD, &c. which are ſuppoſed in their paſſage through the plane PV to leave their traces or veſtigia in the points *a,b,d*, &c. on the plane, and thereby to delineate the pentagon *abdef*; which, as it ſtrikes the eye by the ſame rays that the original pentagon ABDEF does, will be a true perſpective repreſentation of it.

The buſineſs of perſpective, therefore, is to lay down geometrical rules for finding the points *a,b,d,e,f*, upon the plane; and hence alſo we have a mechanical method of delineating any object very accurately.

Perſpective is either employed in repreſenting the ichnographies or ground plots of objects; or the ſcenographies, or repreſentations of the objects themſelves.

But before we give any examples of either, it will be proper to explain ſome techanical terms in regard to perſpective in general: and firſt, the horizontal line is that ſuppoſed to be drawn parallel to the horizon through the eye of the ſpectator; or rather it is a line which ſeparates the heaven from the earth, and which limits the ſight. Thus, A,B, (*ibid.* fig. 2.) are two pillars below the horizontal line CD, by reaſon the line is elevated above them; in fig. 3. they are ſaid to be equal with it, and in fig. 4. raiſed above it. Thus, according to the different points in view, the objects will be either higher or lower than the horizontal line. The point of ſight A (*ibid.* fig. 5) is that which makes the centrical ray on the horizontal line *ab*; or, it is the point where all the other viſual rays DD unite. The points of diſtance, C,C, are points ſet off in the horizontal line at equal diſtances on each ſide of the point of ſight A; and in the ſame figure BB repreſents the baſe line, or fundamental line: EE is the abridgment of the ſquare; of which D,D, are the ſides; F,F, the diagonal lines, which go to the points of diſtance C,C. Accidental points are thoſe where the objects end: theſe may be caſt negligently; becauſe neither drawn to the point or ſight, nor to thoſe of diſtance, but meeting each other in the horizontal line. For example, two pieces of ſquare timber G and H (*ibid.* fig. 6.) make the points I,I,I,I on the horizontal line; but go not to the point of ſight K, nor to the points of diſtance C,C; theſe accidental points ſerve likewiſe for caſements, doors, windows, tables, chairs, &c. The point of direct view, or of the front, is when we have the object directly before us; in which caſe, it ſhews only the foreſide; and, if below the horizon, a little of the top; but nothing of the ſides, unleſs the object be polygonous.

Thus the plan ABCD. (*ibid.* fig. 7.) is all in front, and if it were raiſed we ſhould not ſee any thing of the ſides AB or CD, but only the front AD: the reaſon is, that the point of view E being directly oppoſite thereto, cauſes a diminution on each ſide; which however is only to be underſtood where an elevation is the object; for if it be a plan, it ſhews the whole, as ABCD.

The point of oblique view, is when we ſee an object aſide of us, and as it were aſlant, or with the corner of the eye; the eye, however, being all the while oppoſite to the point of ſight; in which caſe, we ſee the object laterally, and it preſents to us two ſides or faces.

For inſtance, if the point of ſight be in F, (*ibid.* fig. 8) the object GHIK will appear athwart, and ſhew two faces GK and GH, in which caſe it will be a ſide point.

We ſhall now give ſome examples, by which it will appear, that the whole practice of perſpective is built upon the foundation already laid down. Thus, to find the perſpective appearance of a triangle ABC (*ibid.* fig. 9.) between the eye and the triangle draw the line DE, which is called the fundamental line; from 2 draw 2 V, repreſenting the perpendicular diſtance of the eye above the fundamental line, be it what it will; and through V draw, at right angles to 2 V, HK parallel to DE: then will the plane DHKE repreſent the tranſparent plane on which the perſpective repreſentation is to be made. Next to find the perſpective points of the angles of the triangle, let fall perpendiculars A 1, C 2, B 3, from the angles to the fundamental DE: ſet off theſe perpendiculars upon the fundamental oppoſite to the point of diſtance K, to B, A, C; from 1, 2, 3, draw lines to the principal point V; and from the points A, B, and C, on the fundamental line, draw the right lines AK, BK, CK, to the point of diſtance K, which is ſo called, becauſe the ſpectator ought to be ſo far removed from the figure or painting, as it is diſtant from the principal point V. The points *a*, *b*, and *c*, where the viſual lines V 1, V 2, V 3 interſect the lines of diſtance AK, BK, CK, will be the angular points of the angle *a b c*, the true repreſentation of ABC.

To draw a ſquare pavement in perſpective. See fig. 10. and 11. of Plate CXLIII.

Suppoſe your piece of pavement to conſiſt of 64 pieces of marble, each a foot ſquare. Your firſt buſineſs is, to draw an ichnographical plan or ground-plot of it, which is thus performed. Having made an exact ſquare of the ſize you intend your plan, divide the baſe and horizon into eight equal parts; and from every diviſion in the baſe to its oppoſite point in the horizon, rule perpendicular lines: then divide the ſides into the ſame number, ruling parallel lines acroſe from point to point: ſo will your pavement be divided into 64 ſquare feet; becauſe the eight feet in length, multiplied by the ſame in breadth, give the number of ſquare feet or pieces of marble contained in the whole: then rule diagonals from corner to corner; and thus will your ground-plot appear as in fig. 10.

Now, to lay this in perſpective, draw another ſquare to your intended ſize, and divide the baſe line AB into eight equal parts, as before; then fix your point of ſight C in the middle of the horizon DE, and from the ſame point rule lines to every diviſion in the baſe AB; after which, rule diagonal lines from D to B, and from E to A, anſwerable to thoſe in the ground-plot, and your ſquare will be reduced to the triangle ABC; then from the point F, where the diagonal DB interſects the line AC, to the oppoſite interſection G, where the diagonal EA croſſes the line CB, rule a parallel line, which is the abridgment of the ſquare.

Then through the points where the diagonals croſs the reſt of the lines which go from the baſe to the point of ſight, rule parallel lines, and your ſquare pavement will be laid in perſpective, as in fig. 11.

To diminiſh a ſquare viewed by the angle D. See Plate CXLIII. fig. 12.

Having deſcribed the plane ABCD, draw a line to touch

or

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or raſe the angle B, and falling perpendicularly on ED.

This being continued as a baſe line, lay your ruler on the ſide of the ſquare AD and DC, and where the ruler cuts the terreſtrial line make the points H, I.

Then from H and B draw lines to the point of diſtance P, and from I draw a line to the other point of diſtance G; and in the interſection of thoſe lines, make points, which will give you the ſquare KLMB.

To do without the plan: ſet off the diameter each way from the middle point B, as to H and I. But in either caſe no line is to be drawn to the point of ſight O.

To diminiſh a Circle. See Plate CXLIII. fig. 13.

Draw a ſquare ABCD about it, and from the angles AD and CB draw diagonals, dividing the circle into eight parts, and through the points where they cut it OO, draw lines from the baſe line perpendicular to DEF.

Then draw two diagonals QR, SP, interſecting each other at right angles in the centre G.

Having thus diſpoſed the plan, draw lines from all the perpediculars to the point of ſight H; and where they are interſected by the diagonals AK and BI, make points; the two laſt of which M, N give the ſquare, which is to be divided into four by diagonals, interſecting each other in the point P.

In the laſt place, from the extremes of this croſs, draw curve lines through the ſaid points, which will give the form of the circle in *perſpective*.

Of the meaſures upon the baſe in perſpective, Pl. CXLIV.

By the baſe line alone any depth may be given, and in any place at pleaſure, without the uſe of ſquares; which is a very expeditious way.

As for example, ſuppoſe the baſe line BS, (fig. 1.) the point of view A, and the points of diſtance DE; if now you would make a plan of a cube BC, draw two occult or dotted lines from the extremes BC to the point of ſight; then to give the breadth, take the ſame meaſure BC, and ſet it off on the terreſtrial line CF, and from F draw a line to the point of diſtance D; and where this line interſects the firſt ray C in the point G, will be the diminution of the plan of the cube BHGC.

If you would have an object farther towards the middle, take the breadth, and the diſtance of the baſe line, as IK; and to have the depth, ſet it as you would have it on the ſame baſe as LM, and its width both on LM. Then from L and M draw occult lines to the point of diſtance D, and from the points NO, where thoſe lines interſect the ray K, draw parallels to the terreſtrial line, and you will have the ſquare QPON.

After the ſame manner you may ſet off the other ſide of the ſquare which ſhould be on the baſe, as BHGC is here tranſferred to V. The points M and T, which are only two feet from the point S, afford a very narrow figure in X, as being very near.

Of the baſe line, and a ſingle point of diſtance.

Since the depths and widths may be had by the means of this baſe line, there is no need of any further trouble in making of ſquares; as ſhall be ſhewn in this example.

Suppoſe a row of trees or columns is to be made on each ſide; on the baſe line lay down the place, and the diſtance between them, with their breadth or diameters, as ABC; DEFG; then laying a ruler from the point of diſtance O to each of the points ABCDEFG, the interſections it makes on the viſual ray AH will be the bounds of the objects deſired. Fig. 2.

To ſet them off on the other ſide upon the ray GH, ſet one foot of the compaſſes upon the point of the eye H, and with the other ſtrike an arch; the point wherein this cuts the ray GH, will be the correſponding bound.

Thus M will be the ſame with N, and ſo of the reſt; through which drawing parallels, you will have the breadths.

And as for the length, you may make it at pleaſure; ſetting it off from A, as for inſtance, to P, and then from P drawing a line to H; and where this cuts the other parallels, will be formed the plan required; which you may make either round or ſquare.

To find the height and proportion of any objects, as they appear above the horizon on a ſuppoſed plane. See Plate CXLIV. fig. 3.

Firſt rule your horizontal line NO, and fix your point of ſight, as at M; then mark the place of your neareſt pillar, by making a dot for the baſe or bottom, as at A; and another for the ſummit or top, as at B: rule a line from A to the point of ſight M, and another from B to M, and theſe two lines will give the height of any number of pillars. As for example: Suppoſe you would have a pillar at C, fix your dot for the baſe, and rule from thence a parallel line to meet the diagonal AM at D: then rule the perpendicular DE to the diagonal BM: which perpendicular is the height of your figure required at C. Or, if you would place pillars at F and I, obſerve the ſame method, ruling the parallels FG and IK, and the perpendiculars GH and KL will give their heights at the diſtances required.

To find the diameter or thickneſs of pillars at any particular diſtances, you are alſo to be guided by that neareſt the baſe. For inſtance: Suppoſe your neareſt pillar AB to be ten feet high, and one foot in diameter: divide it from top to bottom into ten equal parts, and ſet off one of them upon the baſe of the pillar: then rule a line from the point of ſight M to the diameter P, and you will have the thickneſs of all your pillars on their reſpective parallels or baſes.

The ſame rule exemplified in objects below the horizon. See Plate CXLIV. fig. 4.

If you would know the heights of a number of figures below the horizon, rule your horizontal line QR, and fix your point of ſight, as at P: then place your neareſt figure, or mark the dots for the head and feet, by the points A and B, which anſwers the ſame purpoſe; and rule from theſe dots to the point of ſight the lines AP and BP: and if you would find the height of a figure to be drawn at *c*, rule from thence the parallel *cd* to the diagonal BP, and the perpendicular *de* will give the height required. The ſame directions will ſhew the height of a figure at any other diſtance you have a mind to place it, as at *f*, *i*, and *m*, by ruling the parallels *fg*, *ik*, and *mn*; and from each of theſe their reſpective perpendiculars *gh*, *kl*, and *no*; which perpendiculars will ſhew the heights of the figures at *f*, *i*, and *m*.

4. *To draw a direct view.* See Plate CXLIV. fig. 4.

To illuſtrate this example, ſuppoſe you were to draw the inſide of a church, as repreſented in this figure: Firſt take your ſtation at the point A, in the centre of the baſe line BC:

BC: from which you have a front view of the whole body of the church, with all the pillars, &c. on each ſide: then fix your horizon at any height you think proper, as at DE: biſect it by the perpendicular EA: and where theſe two lines interſect, is the point of ſight F. This perpendicular will paſs through the centres of all the arches in the dome or cupola: which centres may be found by any three given points. Next divide your baſe line into any given number of feet; and the viſual lines, ruled from theſe diviſions to the point of ſight, will reduce all your objects to their juſt proportion, by ſetting off their height upon a perpendicular raiſed at their reſpective diſtances. The baſe, in the example here given, is divided into twelve equal parts of five feet each; from which (ſuppoſing your front column to be 35 feet high) take ſeven diviſions from the baſe line of your drawing, and ſet them off upon the perpendicular GH; then (ſuppoſing this column to be five feet thick at the baſe) ſet off one of thoſe diviſions upon the parallel IK, which is the breadth required. So that, by proportioning this ſcale to any diſtance by the foregoing directions, you may not only find the dimenſions of all your columns, but alſo of every diſtinct part of them, as well as of all the doors, windows, and other objects that occur. For inſtance: Having found the height and breadth of your firſt or neareſt column G, draw from the top and bottom of the ſaid column to the point of ſight the lines HF and KF; after which, rule the line IF from the baſe of the column to the point of ſight, and you have the height and breadth of all the reſt of the columns, as has been already ſhewn in fig. 3.

By ruling lines from the points *a*,*b*,*c*,*d*, &c. to the point of ſight, you will ſee that all the ſummits and baſes of your columns, doors, windows, &c. muſt tend immediately to that point; and by lines drawn from the points 1,2,3, 4, &c. on each ſide, to the correſpondent points on the oppoſite ſide, may be ſeen all the parts of your building lying upon the ſame parallel.

To draw an oblique view. See fig. 6. of Plate CXLIV.

Firſt draw your horizontal line AB; then, if your favourite object be on the right hand, as at C, place yourſelf on the left hand upon the baſe line, as at D; then from that ſtation erect a perpendicular DE, which will paſs through the horizon at the point of ſight F; to which rule the diagonals GF and HF, which will ſhew the roof and baſe of your principal building C, and will alſo, as before directed, ſerve as a ſtandard for all the reſt.

Obſerve alſo, either in direct or oblique views, whether the proſpect before you make a curve; for if it does, you muſt be careful to make the ſame curve in your drawing.

To draw a perſpective view wherein are accidental points. See fig. 7. of Plate CXLIV.

Rule your horizontal line *ab*, and on one part of it fix your point of ſight, as at *c*; from which rule the diagonals *cd* and *ce* on the one ſide, and *cf* and *cg* on the other; which will ſhew the roofs and baſes of all the houſes in the ſtreet directly facing you; (ſuppoſing yourſelf placed at A in the centre of the baſe line:) Then fix your accidental points *g* and *h* upon the horizontal line, and rule from them to the angles *ik* and *lm*, (where the ſtreets on each ſide take a different direction, towards the accidental points *g* and *h*) and the lines *gi* and *gk* give the roofs and baſes of all the buildings on one ſide, as *lh* and *mh* do on the other.

Accidental points ſeldom intervene where the diſtance is ſmall, as in noblemens ſeats, groves, canals, &c. which may be drawn by the ſtrict rules of perſpective: but where the proſpect is extenſive and varied, including mountains, bridges, caſtles, rivers, precipices, woods, cities, &c. it will require ſuch an infinite number of accidental points, that it will be better to do them as nature ſhall dictate, and your ripened judgment approve.

To find the centre for the roof of a houſe, in an oblique view. See fig. 8. of Plate CXLIV.

Suppoſe from the point of ſight A, the viſual lines AB and AC be drawn, BC being one perpendicular given, and DE the other, rule the diagonals from D to C, and from E to E, and the perpendicular FG, raiſed through the point of their interſection, will ſhew the true centre of the roof, as will appear by ruling the lines GE and GC.

For want of being acquainted with this neceſſary rule, many who have been well verſed in other parts of perſpective, have ſpoiled the look of their picture, by drawing the roofs of their houſes out of their true perpendicular.

We ſhall conclude by giving a few practical rules. 1. Let every line, which in the object, or geometrical figure, is ſtraight, perpendicular, or parallel to its baſe, be ſo alſo in its ſcenographic delineation. 2. Let the lines, which in the object return at right angles from the fore-right ſide, be drawn ſcenographically from the viſual point. 3. Let all ſtraight lines, which in the object return from the fore-right ſide, run in a ſcenographic figure into the horizontal line. 4. Let the object you intend to delineate, ſtanding on your right-hand, be placed alſo on the right hand of the viſual point; and that on the left-hand, on the left-hand of the ſame point; and that which is juſt before, in the middle of it. 5. Let thoſe lines which are (in the object) equidiſtant to the returning line be drawn in the ſcenographic figure, from that point found in the horizon. 6. In ſetting off the altitude of columns, pedeſtals, and the like, meaſure the height from the baſe line upwards, in the front or fore-right ſide; and a viſual ray down that point in the front ſhall limit the altitude of the column or pillar, all the way behind the fore-right ſide, or orthographic appearance, even to the viſual point. This rule you muſt obſerve in all figures, as well where there is a front or fore-right ſide, as where there is none. 7. In delineating ovals, circles, arches, croſſes, ſpirals, and croſs-arches, or any other figure in the roof of any room, firſt draw ichnographically, and ſo with perpendiculars from the moſt eminent points thereof, carry it up unto the cieling; from which ſeveral points, carry on the figure. 8. The centre in any ſcenographic regular figure is found by drawing lines from oppoſite angles: for the point where the diagonals croſs, is the centre. 9. A ground-plane of ſquares is alike, both above and below the horizontal line; only the more it is diſtant above or beneath the horizon, the ſquares will be ſo much the larger or wider. 10. In drawing a perſpective figure, where many lines come together, you may, for the directing of your eye, draw the diagonals in red; the viſual lines in black; the perpendiculars in green, or other different colour, from that which you intend the figure ſhall be of. 11. Having conſidered the height, diſtance, and poſition of the figure, and drawn it accordingly, with ſide or angle againſt the baſe; raiſe perpendiculars from the ſeveral angles,

or

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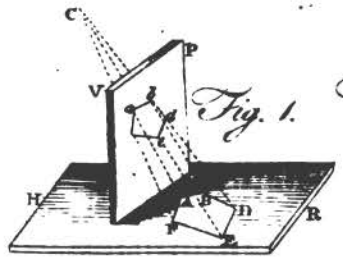


Fig. 1.

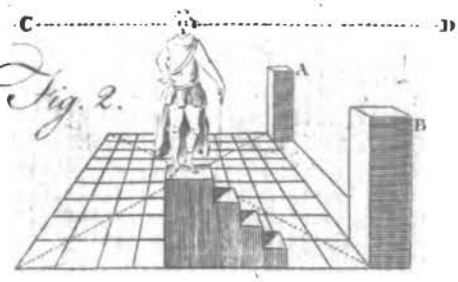


Fig. 2.

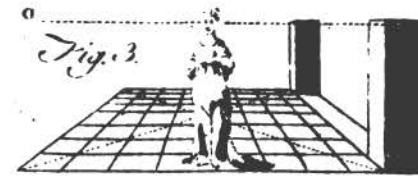
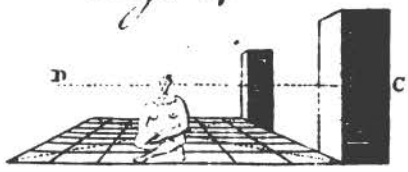


Fig. 3.



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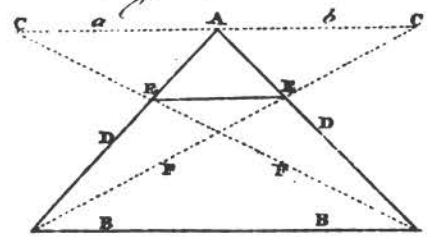

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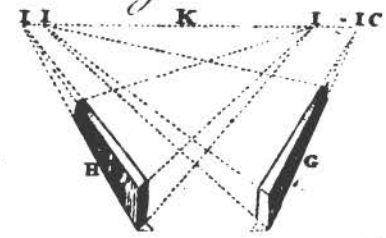

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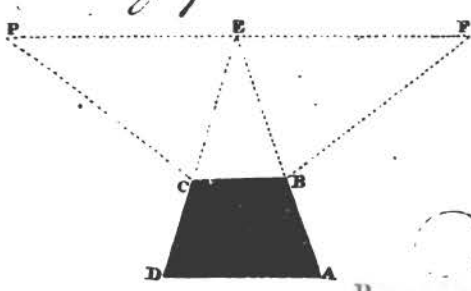

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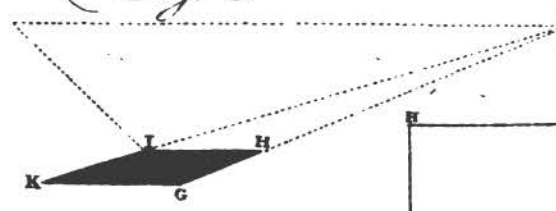

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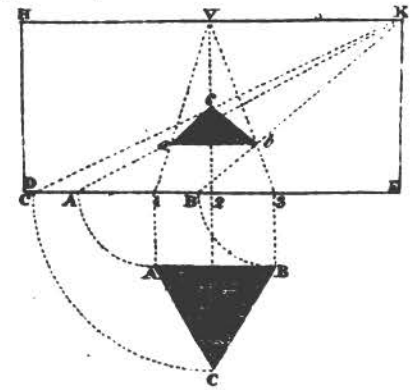

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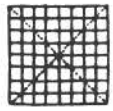

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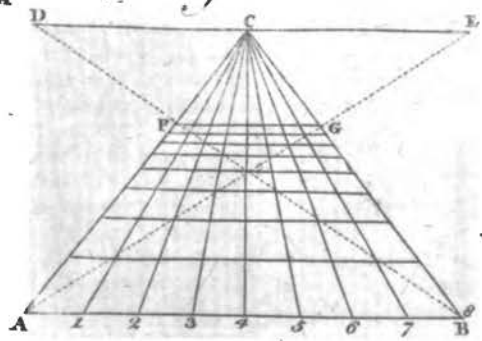

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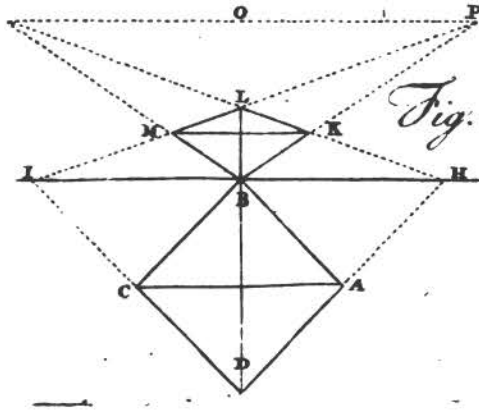

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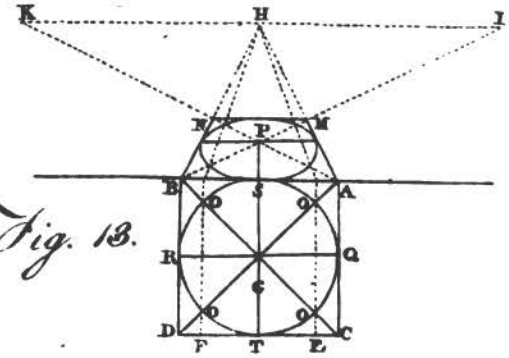

Fig. 13.

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Plate CXLIV

Fig. 1.

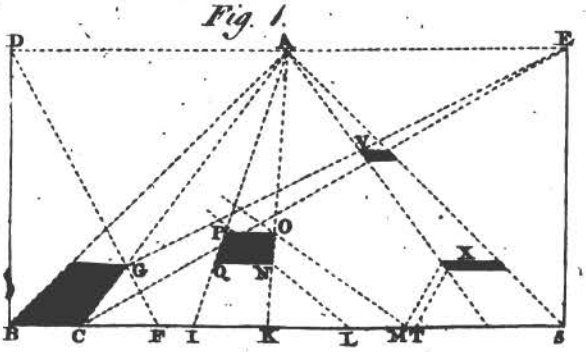


Fig. 2.

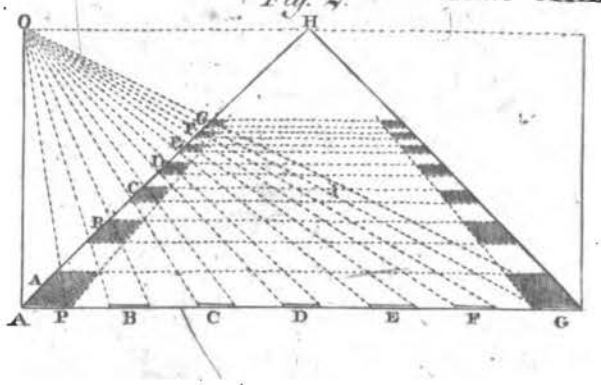


Fig. 3.

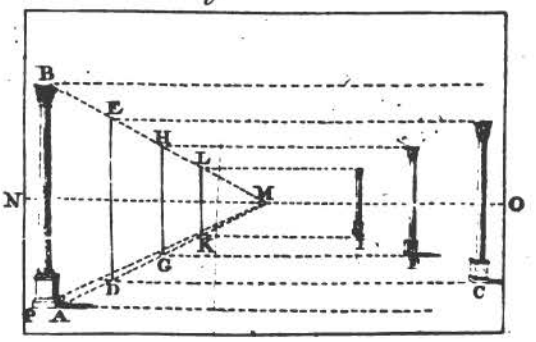


Fig. 4.

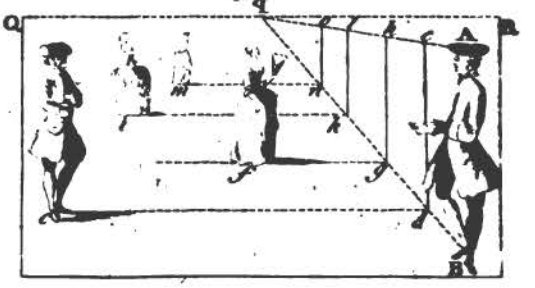


Fig. 5.

Fig. 6.

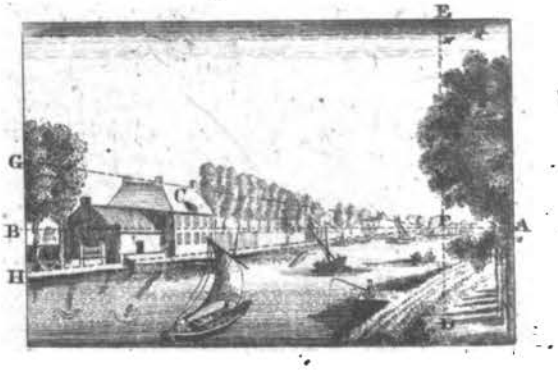


Fig. 7.

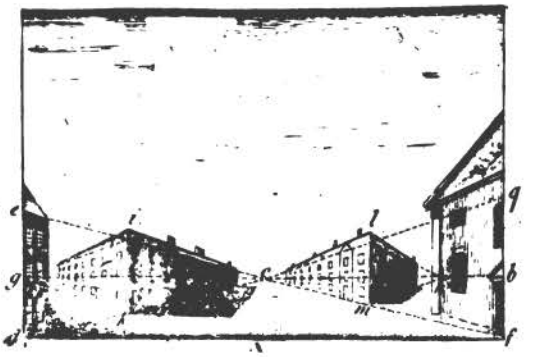
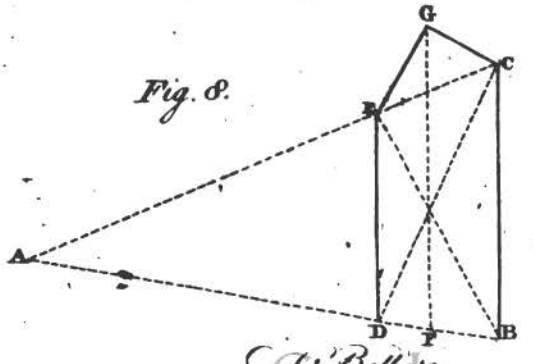


Fig. 8.



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or deſigned points, from the figure to the baſe, and transfer the length of each perpendicular, from the place where it touches the baſe, to the baſe on the ſide oppoſite to the point of diſtance; ſo will the diametrals drawn to the perpendiculars in the baſe, by interſection with the diagonals, drawn to the ſeveral transferred diſtances, give the angles of the figures, and ſo lines drawn from point to point will circumſcribe the ſcenographic figure. 12. If in a landſkip there be any ſtanding-waters, as rivers, ponds, and the like, place the horizontal line level with the fartheſt ſight or appearance of it. 13 If there be any houſe, or the like, in the picture, conſider their poſition, that you may find from what point in the horizontal lines to draw the front and ſides thereof. 14. In deſcribing things at a great diſtance, obſerve the proportion, both in magnitude and diſtance, in draught, which appears from the object to the eye. 15. In colouring and ſhadowing of every thing, you muſt do the ſame in your picture, which you obſerve with your eye, eſpecially in objects lying near; but, according as the diſtance grows greater and greater, ſo the colours muſt be fainter and fainter, till at laſt they loſe themſelves in a darkiſh ſky-colour. 16. The catoptrics are beſt ſeen in a common looking-glaſs, or other poliſhed matter; where, if the glaſs be exactly flat, the object is exactly like its original; but, if the glaſs be not flat, the reſemblance alters from the original; and that more or leſs, according as the glaſs differs from an exact plane. 17. In drawing catoptric figures, the ſurface of the glaſs is to be conſidered, upon which you mean to have the reflection: for which you muſt make a particular ichnographical draught, or projection; which on the glaſs muſt appear to be a plane full of ſquares, on which projection transfer what ſhall be drawn on a plane, divided into the ſame number of like ſquares; where though the draught may appear very confuſed, yet the reflection of it on the glaſs will be very regular, proportional, and regularly compoſed. 18. The dioptric, or broken beam, may be ſeen in a tube through a cryſtal or glaſs, which hath its ſurface cut into many others, whereby the rays of the object are broken. For to the flat of the cryſtal, or water, the rays run ſtraight; but then they break and make an angle, which alſo by the refracted beams is made and continued on the other ſide of the ſame flat. 19. When theſe faces on a cryſtal are returned towards a plane placed directly before it, they ſeparate themſelves at a good diſtance on the plane; becauſe they are all directed to various far diſtant places of the ſame. See OPTICS.

PER

PERSPECTIVE GLASS, in optics, differs from a teleſcope in this: inſtead of the convex eye-glaſs placed behind the image, to make the rays of each pencil go parallel to the eye, there is placed a concave eye-glaſs as much before it; which opens the converging rays, and makes them emerge parallel to the eye. See OPTICS.

PERSPIRATION, in medicine, the evacuation of the juices of the body through the pores of the ſkin. Perſpiration is diſtinguiſhed into ſenſible and inſenſible: and here ſenſible perſpiration is the ſame with ſweating, and inſenſible perſpiration that which eſcapes the notice of the ſenſes; and this laſt is the idea affixed to the word perſpiration when uſed alone.

The matter of inſenſible perſpiration, is a fine ſubtle fluid, which exhales from the body in the form of a vapour, and proceeds from the whole ſurface and from every cavity; it is of an aqueous and ſaline nature, and ſeems to have a great analogy with urine; becauſe in a healthy ſtate, the increaſe of the one diminiſhes the other. Many experiments prove its exiſtence. Sanctorius found, in Italy, under the circumſtances of a moderate diet, middle age, and eaſy life, that the matter inſenſibly perſpired was five-eights of that taken in for food; ſo that there only remained three-eights for nutrition, and for the excrements of the noſe, ears, inteſtines, bladder, &c. The ſame author ſhews, that as much is evacuated by perſpiration in one day, as by ſtool in fourteen days.

But Dr. Bryan Robinſon, of Dublin, has found the caſe very different, both in England and Ireland, and even in South Carolina, in all which places he found that the quantity of urine exceeds that of perſpiration; and that if the meat and drink of one day be four pounds and a half, the perſpiration of that day will be two pounds, the urine two pounds five ounces, and the ſtool three ounces.

PES

The matter of ſweat is ſeparated from the blood by the miliary glands, and is therefore much more groſs than that of inſenſible perſpiration; for as there are no glands which ſerve for the excretion of this laſt fluid, it is ſuppoſed to proceed from the extremities of the capillary arteries.

The uſe of perſpiration is to preſerve the ſuppleneſs of the papillæ of the ſkin; to carry the ſaline particles off from the blood, and by this means to render it more pure; to preſerve the body from various diſeaſes; and to contribute to the cure of the moſt dangerous diſtempers. It may be promoted by exerciſe, by dry frictions with a coarſe linen-cloth or a fleſh-bruſh, by warm baths, and waſhing the hands, feet, head, &c.

PERTH, the capital of the county of the ſame name in Scotland, thirty miles north of Edinburgh.

PERTHAMBOY, a port-town of New-Jerſey, in North America: W. long. 74°. N. lat. 40° 45′.

PERTINENT OF LANDS, in Scots law. See LAW, Tit. xiii. 18.

PERU, formerly a powerful empire in South America, but now a province of Spain, is ſituated between 60° and 81° of weſt longitude, and between the equator and 25° of ſouth latitude, being near 2000 miles in length from north to ſouth, and from 200 to 500 broad: it is bounded by Popayan, on the north; by the mountains of Andes, on the eaſt; by Chili and La Plata, on the ſouth; and by the Pacific Ocean, on the weſt.

PERUGIA, a city of Italy, in the territories of the pope: E. long. 13° 16′, N. lat. 43°.

PERUVIAN BARK. See CINCHONA.

PESARO, a city of Italy, in the province of Urbino, ſituated on the gulph of Venice: E. long. 14°, N. lat. 44°.

PESSARY, in medicine, a ſolid ſubſtance compoſed of wool, lint, or linen, mixed with powder, oils, wax, &c. made

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made round and long like a finger, in order to be introduced into the exterior neck of the matrix, for the cure of ſeveral diſorders incident to the uterus.

PEST, a city of upper Hungary, ſituated on the Danube: E. long. 19° 15′. N lat. 47° 42′.

PESTILENCE, in medicine. See MEDICINE, p. 71.

PETAL, among botaniſts. See BOTANY, p. 637.

PETALISM, in antiquity, a kind of baniſhment practiſed at Syracuſe, by writing the perſon's name on a leaf; whence the name.

PETARD, in the art of war. See GUNNERY, p. 761.

PETACITES, in botany. See TUSSILAGO.

PETECHIÆ, in medicine, denotes ſpots in the ſkin like flea-bites, which come out in malignant fevers, hence called petechial or ſpotted fevers. See MEDICINE, p. 67.

PETER, or *Epiſtles of St.* PETER, two canonical books of the New Teſtament, written by the apoſtle St. Peter, and addreſſed to thoſe Jewiſh converts who were ſcattered throughout Pontus, Galatia, &c. not only upon the perſecution raiſed at Jeruſalem, but upon former diſperſions of the Jews into thoſe places. The firſt of theſe epiſtles is principally deſigned to comfort and confirm them, under thoſe fiery trials they were then ſubject to; and to direct them how to behave in the ſeveral ſtates and relations, both of the civil and the Chriſtian life. In the ſecond epiſtle, the apoſtle proſecutes the ſame ſubject, to prevent their apoſtacy from the faith, and guard them againſt the corrupt principles of the gnoſtics, and thoſe who ſcoffed at the promiſe of Chriſt's coming.

St. PETER'S DAY, a feſtival of the Chriſtian church, obſerved on the twenty-ninth of June.

PETERBOROUGH, a city of Northamptonſhire, ſituated on the river Nen thirty-four miles north-eaſt of Northampton: W. long. 15′, N. lat. 52° 53′. It ſends two members to parliament.

PETER-PENCE, an ancient tax of a penny on each houſe, paid to the pope.

It was called peter-pence becauſe collected on the day of St. Peter *ad vincula*, and ſent to Rome; whence it was alſo called Rome-ſcot and Rome-penny.

PETERSBURG, the capital city of Ruſſia, and one of the largeſt and moſt populous cities in the world, ſituated on both ſides the river Nieva, in the provinces of Carelia and Ingria, between the gulph of Finland and the lake of Ladoga: E. long. 31°, N. lat. 60°. There were no leſs than ſixty-five thouſand houſes built within three or four years after the foundation was laid, which was in the year 1703.

PETERSFIELD, a borough-town of Hampſhire, fifteen miles ſouth-eaſt of Winchester.

PETERSHAGEN, a town of Germany, in the circle of Weſtphalia and duchy of Minden, thirty-ſeven miles weſt of Hanover: ſubject to Pruſſia.

PETHERTON, a market-town of Somerſetſhire, 16 miles ſouth-weſt of Wells.

PETIOLE, in botany, the ſlender ſtalks that ſupports the leaves of a plant.

PETITGUAVES, a port-town of Hiſpaniola, ſituated on a bay at the weſt end of the iſland: W. long. 76°, N. lat. 18° 5′: ſubject to France.

PETITIO PRINCIPII, in logic, the taking a thing for granted, and drawing concluſions from it as ſuch; when it is really falſe, or at leaſt wants to be proved, before any inferences can be deduced from it.

PETITORY ACTION, in Scots law. See LAW, Tit. XXX. 18.

PETITVERIA, in botany, a genus of the hexandria tetragynia claſs. The calix conſiſts of four ſegments; it has no corolla; and but one ſeed with reflected prickles at the point. There are two ſpecies, none of them natives of Britain.

PETRE, or SALT PETRE. See CHEMISTRY, p. 73, 119.

PETREA, in botany, a genus of the didynamia angioſpermia claſs. The calix is large, open, coloured, and divided into five ſegments; the corolla is open and rotated. There is but one ſpecies, a native of America.

PETRIDIA, in natural hiſtory, a genus of ſcrupi, of a plane, uniform ſtructure, of no great variety of colours, and emulating the external form of pebbles.

PETRIFACTION, in phyſiology, denotes the converſion of wood, bones, and other ſubſtances into ſtone.

The foſſile bodies found petrified are principally either of vegetable or animal origin, and are more or leſs altered from their original ſtate, according to the different ſubſtances they have lain buried among in the earth; ſome of them having ſuffered very little change, and others being ſo highly impregnated with cryſtalline, ſparry, pyritical, or other extraneous matter, as to appear mere maſſes of ſtone or lumps of the matter of the common pyrites; but they are generally of the external dimenſions, and retain more or leſs of the internal figure of the bodies into the pores of which this matter has made its way.

The animal ſubſtances thus found petrified are ſea-ſhells; the teeth, bony palates, and bones of fiſh; the bones of land animals, &c. Theſe are found variouſly altered, by the inſinuation of ſtony and mineral matter into their pores; and the ſubſtance of ſome of them is now wholly gone, there being only ſtony, ſparry, or other mineral matter remaining in the ſhape and form.

PETROBRUSSIANS, in church-hiſtory, a religious ſect which aroſe in France and the Netherlands, about the year 1126, ſo called from their leader Peter Bruys. They denied that children, before the uſe of reaſon, can be juſtified by baptiſm. They alſo condemned all places of public woſhip, croſſes, crucifixes; and are ſaid to have rejected the ſacrament of the euchariſt, and prayers for the dead.

PETROLEUM, alſo called rock-oil, is an extremely ſubtle and penetrating fluid, and is much the thineſt of all the native bitumens. It is very light and very pellucid; but though equally bright and clear under all circumſtances, it is liable to a very great variety in its colour. It is naturally almoſt colourleſs, and in its appearance greatly reſembles the moſt pure oil of turpentine: this is called white petroleum, though it has no more colour than water; it is ſometimes tinged of a browniſh, reddiſh, yellowiſh, or faint greeniſh colour; but its moſt frequent colour is a mixture of the reddiſh and blackiſh, in ſuch a degree that it looks black when viewed behind the light, but purple when placed between the eye and a candle or window. It is of a pungent and acrid taſte, and of a very ſtrong and penetrating ſmell, which very much approaches to that of the diſtilled oil of amber. The white

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is moſt eſteemed. It is ſo very inflammable, that while it floats on the ſurface of the water, as it does in many parts of Italy, it takes fire at the approach of a candle.

Petroleum is found in rivers, in wells, and trickling down the ſides of hills along with little ſtreams of water. In ſhort, it is the moſt frequent of all the liquid bitumens, and is perhaps the moſt valuable of them all in medicine. It is to be choſen the pureſt, lighteſt, and moſt pellucid that can be had, ſuch as is of the moſt penetrating ſmell and is moſt inflammable.

It is principally uſed externally, in paralytic caſes, and in pains of the limbs.

PETROMYZON, in ichthyology, a genus belonging to the amphibia nantes claſs. It has ſeven ſpiracula at the ſide of the neck, no gills, a fiſtula on the top of the head, and no breaſt or belly fins. There are three ſpecies, diſtinguiſhed by peculiarities in the back-fins.

PETROSA ossa, in anatomy. See Anatomy, p. 295, *&c.*

PETTAW, a city of Germany, in the circle of Auſtria: E. long. 16° 8′, N. lat. 47°.

PETTIPOLI, a port-town on the coaſt of Cormandel, in the hither India, where the Dutch have a factory: E. long 80°, N. lat, 16° 45′.

PETUNSE, in natural hiſtory, one of the two ſubſtances whereof the porcelain or china-ware is made.

The petunſe is a coarſe kind of flint or pebble, the ſurface of which is not ſo ſmooth, when broken, as that of our common flint.

PEUCEDANUM, in botany, a genus of the pentandria digynia claſs. The fruit is oval, ſtreaked on each ſide, and ſurrounded with a wing; and the involucrum is very ſhort. There are five ſpecies, two of them natives of Britain, *viz.* the officinale, or hogs-fennel, the root of which is recommended in diſorders of the breaſt; and the minus, or rock-parſley.

PEWTER, a factitious metal, uſed in making domeſtic utenſils, as plates, diſhes, *&c.*

The baſis of this metal is tin, which is converted into pewter, by mixing at the rate of an hundred weight of tin with fifteen pounds of lead and ſix pounds of braſs. See Metal.

Beſides this compoſition, which makes the common pewter, there are other kinds compounded of tin, regulus of antimony, biſmuth and copper, in ſeveral proportions.

PEZIZA, in botany, a genus of the cryptogamia fungi claſs. It is ſeſſile and bell ſhaped. There are eight ſpecies, ſix of them natives of Britain.

PHACA, in botany, a genus of the diadelphia decandria claſs. The legumen or pod is ſomewhat bilocular. There are three ſpecies, none of them natives of Britain.

PHÆNOMENON, in philoſophy, denotes any remarkable appearance, whether in the heavens or on earth; and whether diſcovered by obſervation or experiments.

PHAGEDÆNA, denotes a corroding ulcer.

PHAGEDÆNIC medicines, thoſe uſed to eat of fungous or proud fleſh: ſuch are all the cauſtics.

PHALÆNA, in zoology, a genus of inſects belonging to the order of lepidoptera. The feelers are ſetaceous, and taper gradually to the points; the wings are often bent backwards; and the ſpecies of this genus fly about in the night. There are no leſs than 460 ſpecies, comprehending all the moths.

PHALANGIUM, in zoology, a genus of inſects belonging to the order of aptera. They have eight feet, two eyes on the top of the head placed very near each other, and other two on the ſides of the head; the feelers reſemble legs; and the belly is round. There are nine ſpecies.

Phalangium, in botany. See Antheric um.

PHALANX, in Grecian antiquity, a ſquare battalion, conſiſting of eight thouſand men, with their ſhields joined, and pikes croſſing each other; ſo that it was next to impoſſible to break it.

PHALARIS, in botany, a genus of the triandria digynia claſs. It has two carinated valves, of equal lengths, and including the corolla. There are 10 ſpecies, three of them natives of Britain, *viz.* the canarienſis, or manured canary-graſs; the arenaria, or ſea canary-graſs; and the arundinacia, or reed canary-graſs.

PHALEUCIAN verse, in ancient poetry, a kind of verſe which conſiſts of five feet, the firſt of which is a ſpondee, the ſecond a dactyl, and the three laſt trochees.

PHALLUS, in botany, a genus of the cryptogamia fungi claſs. It is woven like a net above, and ſmooth below. There are two ſpecies, both natives of Britain, *viz.* the eſculentus, or eſculent morel; and the impudicus, or ſtinking morel.

PHANATIC, or Fanatic, a term of reproach formerly given to the diſſenters, from a falſe ſuppoſition that they pretended to viſions, *&c.*

PHANTASM, a term ſometimes uſed in a ſynonymous ſenſe with idea, or the notion retained in the mind of an external object.

PHARISEES, a famous ſect of the Jews, who diſtinguiſhed themſelves by their zeal for the traditions of the elders, which they derived from the ſame fountain with the written word itſelf; pretending that both were delivered to Moſes from Mount Sinai, and were therefore both of equal authority. From their rigorous obſervance of theſe traditions, they looked upon themſelves as more holy than other men, and therefore ſeparated themſelves from thoſe whom they thought ſinners or prophane, ſo as not to eat or drink with them; and hence, from the Hebrew word *pharis*, which ſignifies to ſeparate, they had the name of Phariſees or Separatiſts.

PHARMACY, the art which teaches the election, preparation, and mixture of medicines; conſtituting one part of the therapeutic branch of medicine, the objects of which are all natural bodies.

PHARNACEUM, in botany, a genus of the pentandria trigynia claſs. The calix conſiſts of five leaves; it has no corolla; and the capſule has three cells, containing many ſeeds. There are five ſpecies; none of them natives of Britain.

PHAROS, a ſmall iſland in the mediterranean ſea, oppoſite to Alexandria, in Egypt.

Pharos, or Phare, a light-house, a pile raiſed near a port, where fire is kept burning in the night, to guide and direct veſſels near at hand.

PHARSALUS, a town of ancient Theſſaly, ſituated in European Turky, a little ſouth of Lariſſa, in E. lon. 23°, and N. lat. 39°.

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PHARYNX, in anatomy. See ANATOMY, p. 302.

PHASCUM, in botany, a genus of the cryptogamia muſci claſs. The antheræ are operculated, and the calyptra is wanting. There are four ſpecies, all natives of Britain.

PHASEOLOUS, in botany, a genus of the diadelphia decandria claſs. The carina, ſtamina, and ſtylus, are twiſted like a ſcrew. There are 13 ſpecies, none of them natives of Britain.

PHASES, in aſtronomy, the ſeveral appearances or quantities of illumination of the moon, venus, mercury, and the other planets. See ASTRONOMY.

PHASIANUS, in ornithology, a genus belonging to the order of gallinæ. The cheeks are covered with a ſmooth naked ſkin. There are ſix ſpecies, *viz.* 1. The gallus, or dunghill cock and hen, with a compreſſed caruncle or fleſhy-comb on the top of the head, and a couple of caruncles or wattles under the chin; the ears are naked; and the tail is compreſſed, and erected. This bird, though now one of the domeſtic fowls, was originally brought from the Eaſt-Indies. They feed upon grain, graſs-ſeeds, and worms. The cock or male is perhaps the boldeſt and moſt heroic of all the feathered tribe. He claps his wings before he ſings or crows. He begins to crow about midnight, and ſeldom ceaſes till break of day. He is ſo exceedingly ſalacious, that one cock is ſufficient for 10 hens. His ſight is very piercing, and he never fails to cry in a peculiar manner when he diſcovers any bird of prey in the air. The hen is very prolific: ſhe makes her neſt on the ground; and the young, immediately after they are hatched, follow her, and pick up their food themſelves. There are ſix or eight varieties of this ſpecies. 2. The motmot, or Guinea pheaſant, is browniſh, ſomewhat red below, with a wedge-like tail, and wants ſpurs. It is a native of Guinea and Braſil. 3. The colchicus, is red, with a blue head, a wedge-ſhaped tail, and papillous cheeks. It is a native of Aſia. 4. The argus is yelloviſh, with black ſpots, a red face, and a blue creſt on the back part of the head. It is found in Chineſe Tartary. 5. The pictus, has a yellow creſt, a red breaſt, and a wedge-ſhaped tail. It is a native of China. 6. The nycthemerus, is white, with a black creſt and belly, and a wedge-ſhaped tail. It is a native of China. See Plate CXLII.

PHASMATA, in phyſiology, certain appearances ariſing from the various tinctures of the clouds, by the rays of the heavenly luminaries, eſpecially the ſun and moon. Theſe are infinitely diverſified by the different figures and ſituation of the clouds, and the appulſes of the rays of light.

PHASSACHATES, in natural hiſtory, the name of a ſpecies of agate, which the ancients, in its different appearances, ſometimes called alſo leucachates and perileucos. See AGATE.

PHEASANT, in ornithology. See PHASIANUS.

PHELLANDRIUM, in botany, a genus of the pentandria digynia claſs. The fruit is oval and ſmooth. There are two ſpecies, one of them, *viz.* the aquaticum, or water hemlock, is a native of Britain.

PHELYPÆA, in botany. See LATHRÆA.

PHENICIA, a ſubdiviſion or province of Syria, ſituated on the Levant, or eaſtern part of the Mediterranean ſea, on the confines of Paleſtine.

PHEONS, in heraldry, the barbed heads of darts, arrows, or other weapons, and uſually repreſented as in Plate CXLV. fig. 1.

PHIDITIA, in Grecian antiquity, feaſts celebrated with great frugality at Lacedæmon. The phiditia were held in the public places, and in the open air: rich and poor aſſiſted at them alike, and on the ſame footing; their deſign being to keep up peace, friendſhip, and a good underſtanding and equality among all the citizens, great and ſmall. It is ſaid, that they who attended this feaſt, brought each a buſhel of flour, eight meaſures of wine named chorus, five minæ of cheeſe, and as much figs.

PHILADELPHIA, the capital of the province of Penſilvania, in North America, ſituated on the rivers Delawar and Schoolkill: W. long. 74°, N. lat. 40° 50′.

PHILADELPHIA is alſo the name of an ancient town of the Leſſer Aſia, ſituated in E. long. 29°, N. lat. 38°.

PHILADELPHUS, in botany, a genus of the icoſandria monogynia claſs. The calix conſiſts of four or five ſegments, and the corolla of four or five petals; and the capſule has four or five cells, containing many ſeeds. There are two ſpecies, none of them natives of Britain.

PHILIP-FORT, a fortreſs in Dutch Brabant, ſituated on the eaſt ſide of the Scheld, oppoſite to Pearl-fort, five miles north-weſt of Antwerp.

PHILIPPI, an ancient town of Macedonia, a province of European Turky, ſituated in E. long. 25°, N. lat. 41°.

PHILIPPICS, in literature, a name given to the orations of Demoſthenes againſt Philip king of Macedon; being eſteemed the maſter-pieces of that great orator.

Philippic is alſo a term applied to the fourteen orations of Cicero againſt Mark Anthony.

PHILIPPINE ISLANDS, are ſituated in the Pacific ocean, in Aſia, between 114° and 131° eaſt longitude, and between 5° and 19° north latitude: there are a great number of them, and ſome very large.

PHILIPPINES, a religious ſociety of young women, at Rome; ſo called from their taking St. Philip de Neri for their protector: they conſiſt of an hundred poor girls, who are brought up till they are of age to be married, or become nuns, under the direction of ſome religious women, who teach them to read, write, and work; and inſtruct them in the duties of Chriſtianity. They wear a white veil, and a black croſs on their breaſts.

PHILIPPOPOLI, a city of European Turky, in the province of Romania, ſituated on the river Mariza: in E. long. 25°, and N. lat. 42° 20′.

PHILIPSBURGH, a city of Germany, in the palatinate of the Rhine, ſituated on the eaſt bank of the river Rhine, in E. long. 8° 16′, N. lat. 49° 8′.

PHILIPSTAT, a town of Sweden, in the province of Gothland and territory of Wermeland, ſituated in E. long. 14°, N. lat. 59° 50′.

PHILLYREA, in botany, a genus of the diandria monogynia claſs. The corolla conſiſts of four ſegments, and the berry contains four ſeeds. There are three ſpecies, none of them natives of Britain.

PHILOLOGY, a ſcience, or rather aſſemblage of ſeveral ſciences, conſiſting of grammar, rhetoric, poetry, antiquities, hiſtory, and criticiſm;

Phylology is a kind of univerſal literature, converſant about all the ſciences, their riſe, progreſs, authors, &c. It makes what the French call the *belles lettres*.

PHILOMATHES, a lover of learning or ſcience.

PHILONIUM,

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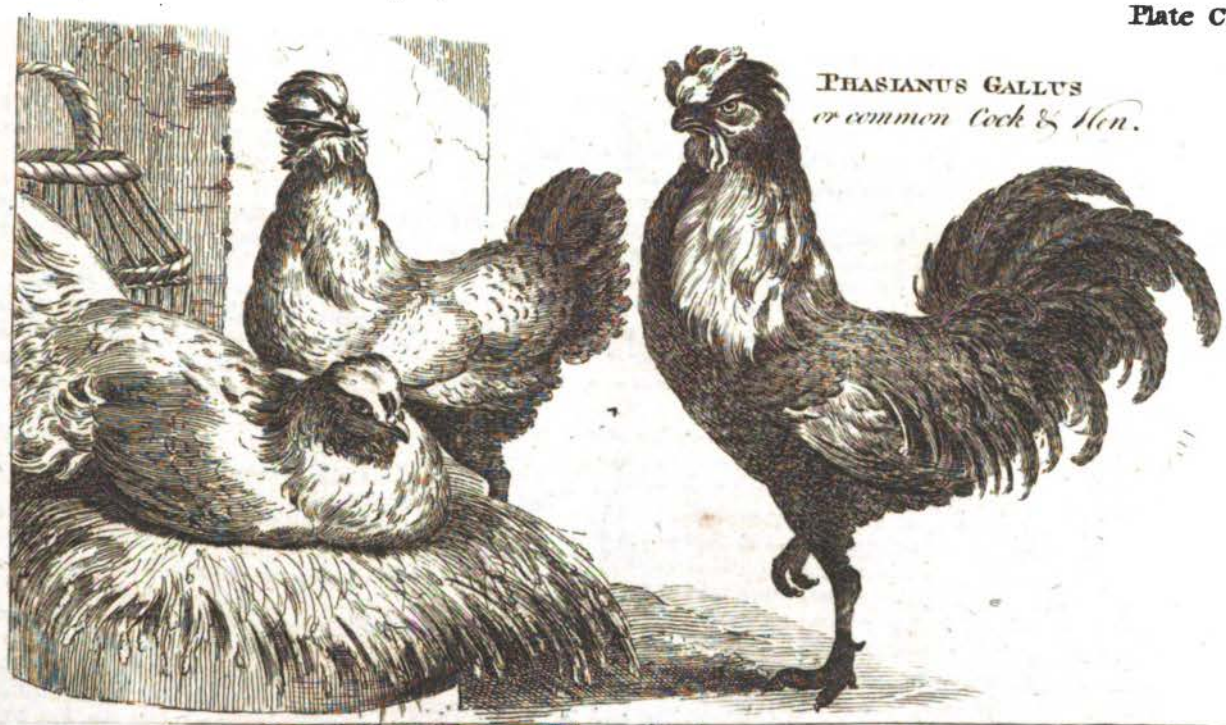
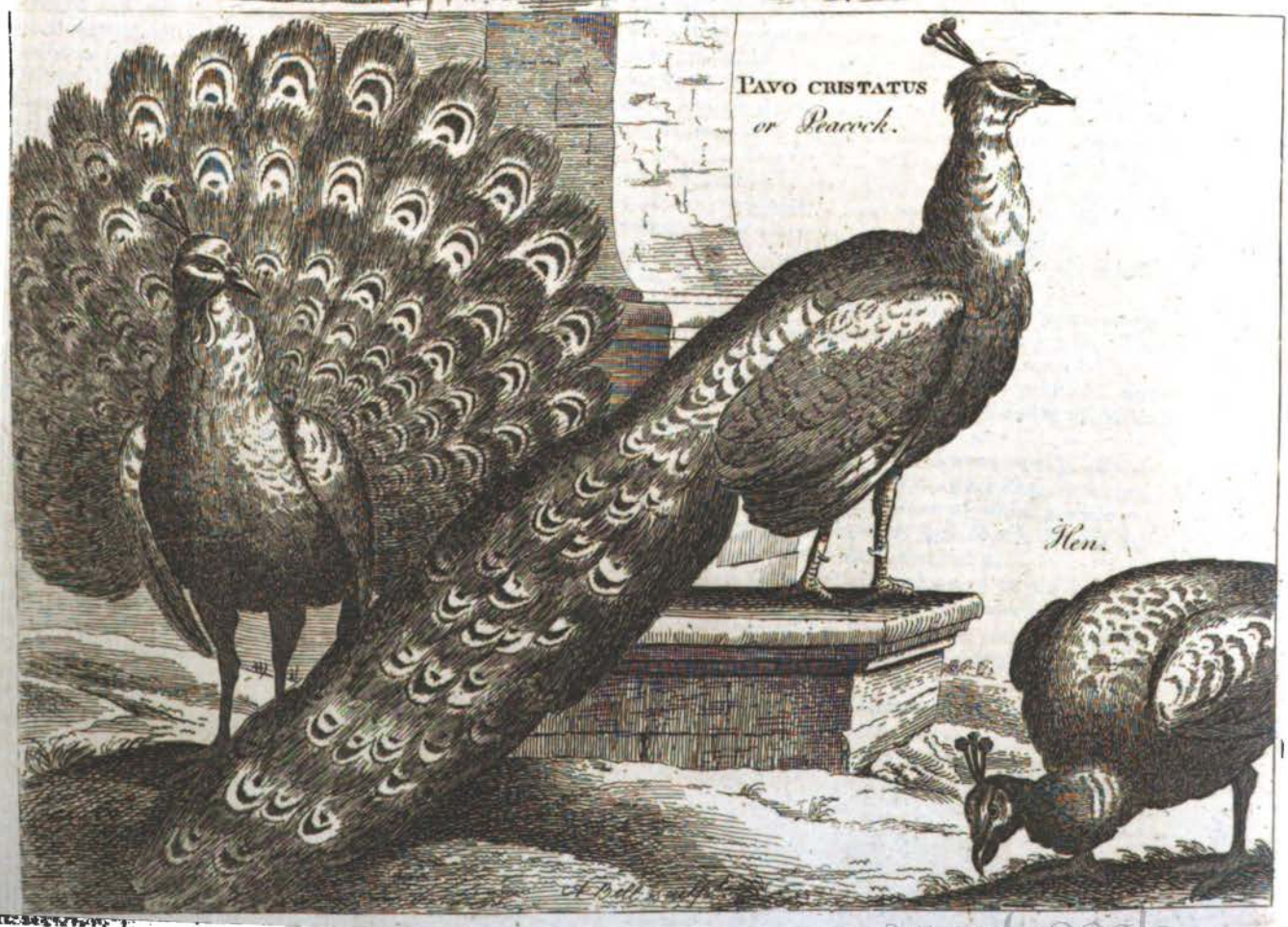


PHASIANUS GALLUS
or common Cock & Hen.



PAVO CRISTATUS
or Peacock.

Hen.

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PHILONIUM, in pharmacy, a kind of ſomniferous anodyne opiate, taking its name from Philo the inventor.

PHILOSOPHER, a perſon verſed in philoſophy; or one who makes profeſſion of, or applies himſelf to, the ſtudy of nature and morality.

PHILOSOPHER'S STONE, the greateſt object of alchymy, is a long ſought for preparation, which, when found, is to convert all the true mercurial part of metal into pure gold, better than any that is dug out of the mines, or perfected by the refiner's art; and this only by caſting a little quantity thereof upon metals in fuſion, whilſt that part of the metal which was not mercury is immediately burnt or blown away. But this, like every other ſcientific chimera, will for ever elude the reſearches of mankind.

PHILOSOPHIC, or PHILOSOPHICAL, ſomething that relates to philoſophy. See PHILOSOPHY.

PHILOSOPHICAL EGG, among chemiſts, a thin glaſs body, or bubble, of the ſhape of an egg, with a long neck or ſtem, uſed in digeſtions.

PHILOSOPHY, the knowledge or ſtudy of nature and morality, founded on reaſon and experience. See MECHANICS, OPTICS, ASTRONOMY, LOGIC, MORALS, *&c.*

PHILYCA, in botany, a genus of the pentandria monogynia claſs. The perianthium is turbinated, and divided into five ſegments; it has no petals, but five ſcales fortifying the ſtamina. There are ſix ſpecies, none of them natives of Britain.

PHIMOSIS, in medicine, a diſorder of the penis, in which the prepuce is rendered ſo ſtrict or tenſe, that it cannot be drawn back over the glans. See MEDICINE.

PHLEBOTOMY, the opening a vein with a proper ſharp-edged and pointed inſtrument of ſteel, in order to let out a proper quantity of blood, either for the preſervation or recovery of a perſon's health.

PHLEGM, in the animal œconomy, one of the four humours whereof the ancients ſuppoſed the blood to be compoſed.

The chemiſts make phlegm, or water, an elementary body, the characters of which are fluidity, inſipidity, and volatility.

PHLEGMAGOGUES, in pharmacy, ſuch medicines as purge off phlegm: ſuch are hermodactyls, agaric, turbith, jalap, *&c.*

PHLEGMATIC, among phyſicians, an appellation given to that temperament, or habit of the body, wherein phlegm is predominant; which gives riſe to catarrhs, coughs, *&c.*

PHLEGMON, denotes an external inflammation and tumour, attended with a burning heat, *&c.*

PHLEUM, in botany, a genus of the triandria digynia claſs. The calix conſiſts of two linear, truncated valves; there are five ſpecies, three of them natives of Britain, *viz.* the pratenſe, or meadow cat's-tail-graſs; the paniculatum, or branched cat's-tail-graſs; and the nodoſum, or bulboſe cat's-tail-graſs.

PHLOGIDIAUGIA, a claſs of foſſils, the characters of which are, that the bodies comprehended in it are tranſparent and inflammable: ſuch are ſulphur, orpiment, zarnick, and amber.

PHLOGISCIERIA, another claſs of foſſils, which are inflammable bodies of a coarſer and more impure texture, and not pellucid: ſuch are ambergreaſe, jet, aſphaltus ampelites, and lithanthrax.

PHLOGISTON. See CHEMISTRY, p. 68.

PHLOGONIÆ, a claſs of compound, inflammable, and metallic foſſils, found in ſmall maſſes of determinately angular figures; comprehending the pyricubia, pyroctogonia, and pyripolygonia.

PHLOMIS, in botany, a genus of the didynamia gymnoſpermia claſs. The calix is angular; and the ſuperior lip of the corolla is compreſſed, incumbent, and hairy. There are twelve ſpecies, none of them natives of Britain.

PHLOX, in botany, a genus of the pentandria monogynia claſs. The corolla is ſhaped like a jug; the filaments are unequal; the ſtigma is trifid; and the capſule has three cells, and contains but one ſeed.

PHLYCTÆNÆ, in medicine, ſmall eruptions on the ſkin.

PHOCA, in zoology, a genus of quadrupeds of the order of the feræ. It has ſix parallel fore-teeth in the upper jaw, the outermoſt being larger; and four blunt, parallel, diſtinct, equal fore-teeth in the under jaw: It has but one dog-tooth, and five or ſix three pointed grinders; and the hind-feet are united ſo as to reſemble a fiſh's tail. There are three ſpecies, *viz.* 1. The urſina, or ſea-bear, has external ears. This animal ſwims with incredible ſwiftneſs: The males have often 120 females, ſons, and daughters, in their train. They copulate on the ſhore, the female lying on their backs. They are hardly afraid of men, and bite ſtones when thrown at them. Each has a particular ſtone for his bed, which they ſeldom deſert. They often fight for their wives and beds; when one is beat off, another makes a freſh attack, and thus ſucceed alternately, two never attacking one, till the whole be engaged, when they make a hideous wailing noiſe. They are found in the northern ſeas. 2. The leonina, or ſea-lion, has a creſt on his forehead. They are found near the ſouth pole. They ſwim in troops, and fight for their wives. 3. The vitulina, or ſea-calf, has a ſmooth head, without external ears. They inhabit the European ocean. They generally ſleep upon ſtones above the water, and are eaſily killed by a ſtroke above the noſe.

PHOCEA, a city of Oeolis, on the weſt coaſt of the leſſer Aſia, anciently ſo called.

PHOENICOPTERUS, or FLAMINGO, in ornithology, a genus of birds belonging to the order of grallæ. The beak is naked, teethed, and bent as if it were broken; the noſtrils are linear; and the feet are palmated, and four-toed. There is but one ſpecies, a native of Africa and America.

PHOENIX, in aſtronomy. See ASTRONOMY, p. 487.

PHOENIX, the GREAT PALM, or DATE-TREE, in botany, a genus of plants, the characters of which are not yet perfectly aſcertained: the male and female flowers are on diſtinct plants, or on the ſame ſpadix.

PHOLAS, a genus of inſects belonging to the order of vermes teſtacea. The ſhell is double-valved and divaricated; the cardo is turned backwards, and connected by a cartilage. There are ſix ſpecies, diſtinguiſhed by the figure of their ſhells.

PHONICS, the doctrine or ſcience of ſounds, otherwiſe called acouſtics. See PNEUMATICS.

PHOSPHORUS. See CHEMISTRY, p. 123.

PHRENES,

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PHRENES, in anatomy. See ANATOMY, p. 213.

PHRENSY, in medicine, an inflammation of the membranes of the brain, attended with an acute fever and delirium. See MEDICINE, p. 88.

PHRYGIA, the Greater and Leſſer, two provinces anciently of Aſia Minor; having the Helleſpont on the north.

PHTHIRIASIS, in medicine, the pedicularis morbus, or louſy diſeaſe, is moſt incident to children, though adults are not wholly exempt from it.

PHTHISIS, a ſpecies of conſumption, ariſing from an ulcer of the lungs. See MEDICINE, p. 103.

PHYLLANTHUS, in botany, a genus of the monoecia triandria claſs. The calix both of the male and female conſiſts of eight ſegments; neither of them have any corolla; the female has three bifid ſtyli; the capſule has three cells, and contains one ſeed. There are ſix ſpecies, none of them natives of Britain.

PHYLLIS, in botany, a genus of the pentandria digynia claſs. The ſtigmata are rough; and the fruit is ſparce. There are two ſpecies none, of them natives of Britain.

PHYSALIS, in botany, a genus of the pentandria monogynia claſs. The corolla is rotated; the ſeeds are connivent; and the berry has two cells, and is contained within an inflated calix. There are ten ſpecies, none of them natives of Britain.

PHYSETER, in zoology, a genus belonging to the order of Cete. It has teeth in the under jaw, and a fiſtula in in the head or ſnout. There are four ſpecies, *viz.* 1. The catodon, with a fiſtula in the ſnout, and having no back-fin. 2. The macrocephalus has a fiſtula in the neck, and no back-fin. The ſpermaceti is extracted from the ventricles of its brain. 3. The microps, with a long fin on the back, and the upper jaw much longer than the under one. 4. The turſio, with a very high fin on the back, and the points of the teeth blunt. All the four ſpecies are inhabitants of the northern Ocean.

PHYSIC. See MEDICINE.

PHYSICAL, ſomething relating to nature.

PHYSICIAN, a perſon who profeſſes medicine, or the art of healing diſeaſes.

PHYSICS, a denomination ſometimes given to natural philoſophy.

PHYSIOLOGY, properly denotes a diſcourſe of nature, and natural bodies; or, it is that part of natural philoſophy which treats of the various phænomena of nature in a ſcientifical and ſpeculative way.

Among phyſicians, the term phyſiology denotes the hiſtory of the human body and its ſeveral conſtituent parts, with their relations and functions.

PHYTEUMA, in botany, a genus of the pentandria monogynia claſs. The corolla is rotated, with linear laciniæ; the ſtigma is trifid; and the capſule has two or three cells. The ſpecies are ſix, only one of them, *viz.* the orbicularis, or horned rampions, a native of Britain.

PHYTOLACCA, in botany, a genus of the decandria decagynia claſs. It has no calix; the petals are five; and the berry has ten cells, and ten ſeeds. There are four ſpecies, none of them natives of Britain.

PHYTOLOGY, a diſcourſe concerning the kinds and virtues of plants.

PIA MATER, in anatomy, See ANATOMY, p. 285.

PICA, in ornithology. See CORVUS.

PICA, in medicine, a depravation of appetite, which makes the patient long for what is unfit for food, or incapable of nouriſhing, as chalk, aſhes, coals, plaſter, lime, *&c.*

PICÆ, the name of a claſs of birds. See NATURAL HISTORY.

PICARDY, a province of France, bounded by the French Netherlands, and the ſtraights of Dover, on the north and eaſt; by the iſle of France, on the ſouth; and by Normandy, and the Engliſh channel, on the weſt.

PICKLE, a brine or liquor, commonly compoſed of ſalt, vinegar, *&c.* ſometimes with the addition of ſpices; wherein meat, fruit, and other things are preſerved and ſeaſoned.

PICKERY, in Scots law, petty theft, or ſtealing things of ſmall value

PICQUERING, a flying war or ſkirmiſh made by ſoldiers detached from two armies for pillage, or before a main battle begins.

PICRIS, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is naked; the calix is caliculated; the pappus is feathery; and the ſeeds are furrowed tranſverſely. There are four ſpecies, two of them natives of Britain, *viz.* the echioides, or ox's tongue; and the hieracioides, or yellow ſuccory.

PICTS WALL, in antiquity, a wall begun by the emperor Adrian, on the northern bounds of England, to prevent the incurſions of the Picts and Scots. It was firſt made only of turf, ſtrengthened with palliſadoes, till the emperor Severus coming in perſon into Britain built it with ſolid ſtone. This wall, part of which ſtill remains, begun at the entrance of Solway-frith in Cumberland, and running N. E. extended to the German ocean

PICTURE, a piece of painting, or a ſubject repreſented in colours, on wood, canvas, paper, or the like.

PICUS, the WOOD-PECKER, in ornithology, a genus belonging to the order of picæ. The beak is ſtrait, and conſiſts of many ſides, and like a wedge at the point; the noſtrils are covered with briſtly feathers; the tongue is round like a worm, very long, ſharp at the point, which is beſet with briſtles bent backwards. There are 21 ſpecies, diſtinguiſhed by their colour.

PIECE, in heraldry, denotes an ordinary or charge. See CHARGE

PIEDMONT, a principality of Italy, ſo called from its lying at the foot of the Alps. It is bounded by Savoy, from which it is ſeparated by the Alps, on the north; by the duchies of Milan and Montſerrat, on the eaſt; by the territories of Genoa, and the county of Nice, on the ſouth; and by France, on the weſt; being about 100 miles long, and 70 broad.

PIER, in building, denotes a maſs of ſtone, *&c.* oppoſed by way of fortreſs againſt the force of the ſea, or a great river, for the ſecurity of ſhips that lie at harbour in any haven.

PIETISTS, a religious ſect ſprung up among the proteſtants of Germany, ſeeming to be a kind of mean between the quakers of England, and the quietiſts of the Romiſh church.

PIG, in zoology. See SUS.

Guinea-PIG. See MUS.

PIG *of lead*, the eighth part of a fother, amounting to two hundred and fifty pounds weight.

PIGEON, in ornithology. See COLUMBA.

PIGMENTS, preparations uſed by painters, dyers, *&c.* to impart

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impart colours to bodies, or to imitate particular colours.

PIGUS, in ichthyology. See CYPRINUS.

PIKE, in ichthyology. See LUCIUS.

PILASTER, in architecture. See ARCHITECTURE, p. 353.

PILCHARD, in ichthyology. See CLUPEA.

PILE, in heraldry, an ordinary in form of a wedge, contracting from the chief, and terminating in a point towards the bottom of the ſhield. See Plate CXXXIV. fig. 16.

The pile, like other ordinaries, is borne inverted, ingrailed, &c. and iſſues indifferently from any point of the verge of an eſcutcheon.

PILES, in medicine. See MEDICINE, p. 143.

PILGRIMAGE, a kind of religious diſcipline, which conſiſts in taking a journey to ſome holy place, in order to adore the relics of ſome deceaſed ſaint. Pilgrimages began to be made about the middle ages of the church; but they were moſt in vogue after the end of the eleventh century, when every one was for viſiting places of devotion, not excepting kings and princes themſelves; and even biſhops made no difficulty of being abſent from their churches on the ſame account. The places moſt viſited were Jeruſalem, Rome, Compoſtella, and Tours; but the greateſt numbers now reſort to Loretto, in order to viſit the chamber of the bleſſed virgin, in which ſhe was born, and brought up her ſon Jeſus, till he was twelve years of age.

PILL, in pharmacy, a form of medicine reſembling a little ball, to be ſwallowed whole, invented in favour of ſuch as cannot take bitter and ill-taſted medicinal draughts, as alſo to keep in readineſs for occaſional uſe without decaying.

PILLAR, in architecture, a kind of irregular column, round and inſulated, but deviating from the proportions of a juſt column. See ARCHITECTURE.

PILLORY, was anciently a poſt erected in a croſs road, by the lord of the manor, with his arms upon it, as a mark of his ſeignory, and ſometimes with a collar to fix criminals to.

PILOT, a perſon employed to conduct ſhips over bars and ſands, or through intricate channels, into a road or harbour.

PIMENTO, in botany. See MYRTUS, of which it is a ſpecies.

The fruits are gathered when green, and are expoſed to the ſun for many days on cloths, frequently ſhaking and turning them, till thoroughly dry; they take great care they are not wetted by the morning and evening dews; and when thus dried, are ſent over to us.

Pimento abounds with a fragrant eſſential oil, which is ſeparated, in great quantity, in diſtillation, and is ſo heavy that it ſinks in water. This ſpice is much uſed in our foods, and ſometimes in medicine: it is, indeed, a very good aromatic, and ſo well imitates the mixed flavour of all the reſt, that it has long been a common practice to make the aqua mirabilis, which was ordered to be diſtilled from all the ſpices, of this ingredient alone; and the taſte of the water thus made, when carefully done, is ſo near the genuine, that a very nice palate can only diſtinguiſh it.

PIMPINELLA, in botany, a plant of the pentandria digynia claſs. The fruit is oblong; and the corolla is ſub-radiated. There are four ſpecies, two of them natives of Britain, *viz.* the major, or great burnet ſaxifrage; and the ſaxifraga, or ſmall burnet ſaxifrage.

PIN, in commerce, a little neceſſary implement made of braſs-wire, uſed chiefly by the women in adjuſting their dreſs.

The perfection of pins conſiſts in the ſtiffneſs of the wire and its whiteneſs, in the heads being well turned, and in the fineneſs of the points. The London pointing and whitening are in moſt repute; becauſe our pin-makers, in pointing, uſe two ſteel-mills, the firſt of which forms the point, and the latter takes of all irregularities, and renders it ſmooth, and as it were poliſhed; and in whitening, they uſe block-tin granulated; whereas in other countries they are ſaid to uſe a mixture of tin, lead, and quick-ſilver.

PINDARIC, in poetry, an ode formed in imitation of the manner of Pindar.

PINE, in botany. See PINUS.

PINE-APPLE. See BROMELIA.

PINEAL GLAND, in anatomy. See ANATOMY, p. 286.

PINGUICULA, in botany, a genus of the diandria monogynia claſs. The corolla is ringent; the calix is bilabiated; and the capſule has but one cell. There are four ſpecies, two of them natives of Britain, *viz.* the vulgaris, or butter-wort; and the luſotanica, or Cornwall butter-wort.

PINION, in mechanics, an arbor, or ſpindle, in the body whereof are ſeveral notches, which catch the teeth of a wheel that ſerves to turn it round: or it is a leſſer wheel which plays in the teeth of a larger.

PINK, a veſſel uſed at ſea, maſted and rigged like other ſhips, only that this is built with a round ſtern; the bends and ribs compaſſing ſo as that her ribs bulge out very much.

PINK, in botany. See DIANTHUS.

PINNACE, a ſmall veſſel uſed at ſea, with a ſquare ſtern, having ſails and oars, and carrying three maſts, chiefly uſed as a ſcout for intelligence, and for landing of men, &c.

PINNACLE, in architecture, the top or roof of an houſe, terminating in a point.

PINNATED LEAVES, in botany. See BOTANY, p. 640.

PINUS, in botany, a genus of the monœcia monadelphia claſs The calix of the male conſiſts of four leaves; it has no corolla; the ſtamina are numerous, with naked antheræ. The calix of the female is a ſtrobilus, containing two flowers; it has one piſtillum; and the nut is embraced by a membranaceous wing. There are 12 ſpecies, three of them natives of Britain, *viz* the ſylveſtris, or Scotch fir; the picea, or yellow-leaved fir; and the abies, or common fir.

PIONEER, in the art of war, a labourer employed in an army to ſmooth the roads, paſs the artillery along, and dig lines and trenches, mines, and other works.

PIPE, in law, is a roll in the exchequer, called alſo the great roll. See the next article.

PIPE-OFFICE, is an office, wherein a perſon, called the clerk of the pipe, makes out leaſes of crown-lands, by warrant from the lord-treaſurer, or commiſſioners of the treaſury, or chancellor of the exchequer.

PIPER, PEPPER, in botany, a genus of the diandria trigynia claſs. It has neither calix nor corolla; the berry contains

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contains but one ſeed. There are 20 ſpecies, all natives of warm countries.

PIPER, in ichthyology. See TRIGLA.

PIRACY, in Scots law. See LAW, Tit. xxxiii.

PIRATE, a perſon, or veſſel, that robs on the high ſeas, without permiſſion or authority of any prince or ſtate.

PISA, a city of Italy, in the duchy of Tuſcany, ſituated on the river Arno, four miles eaſt of the ſea, and ten miles north of Leghorn.

PISCARY, in our ancient ſtatutes, the liberty of fiſhing in another man's waters.

PISCES, in aſtronomy, the twelfth ſign or conſtellation of the zodiac. See ASTRONOMY, p. 487.

PISCINA, in antiquity, a large baſon in a public place or ſquare, where the Roman youth learned to ſwim, and which was ſurrounded with a high wall, to prevent caſting of filth into it.

PISSAPHALTUM, EARTH PITCH, a fluid, opake, mineral body, of a thick conſiſtence, of a ſtrong ſmell, readily inflammable, but leaving a reſiduum of greyiſh aſhes after burning. It ariſes out of the cracks of rocks, in ſeveral places in the iſland of Sumatra, and in ſome other parts of the Eaſt-Indies, and is much eſteemed there, in paralytic diſorders.

PISSELÆUM INDICUM, BARBADOES TAR, a mineral fluid, of the nature of the thicker bitumens, and of all others the moſt approaching in appearance, colour, and conſiſtence, to the true piſſaſphaltum, though differing from it in other reſpects. It is very frequent in many parts of America, where it is found trickling down the ſides of mountains in large quantities, and ſometimes floating on the ſurface of the waters. It has been greatly recommended internally in coughs and other diſorders of the breaſt and lungs.

PISTACIA, in botany, a genus of the dioecia pentandria claſs. The calix of the amentum in the male conſiſts of five ſegments; it has no corolla: The calix of the female conſiſts of three ſegments; it has no corolla; there are three ſtyli; and the drupa contains one ſeed. There are five ſpecies, all natives of warm climates.

Piſtachia-nuts abound with a ſweet and well-taſted oil, which they will yield in great abundance, on being preſſed after bruiſing them: they are reckoned wholeſome and nutritive, and are very proper to be preſcribed by way of reſtoratives, eaten in a moderate quantity, and to people emaciated with long illneſſes.

PISTIL, among botaniſts. See BOTANY, p. 637.

PISTOL, the ſmalleſt piece of fire-arms, born at the ſaddle bow, on the girdle, and in the pocket.

PISTOLE, a gold-coin, ſtruck in Spain, and in ſeveral parts of Italy, Switzerland, *&c.*

The piſtole has its augmentations and diminutions, which are quadruple piſtoles, double piſtoles, and half piſtoles.

PISTON, in pump-work, is a ſhort cylinder of metal, or other ſolid ſubſtance, fitted exactly to the cavity of the barrel or body of the pump. See HYDROSTATICS.

PISUM, in botany, a genus of the diadelphia decandria claſs. The ſtylus is triangular, carinated and downy above; and the two upper laciniæ of the calix are ſhorter than the reſt. The ſpecies are four, only one of them, *viz.* the marinum, or ſea-peaſe, a native of Britain.

Peas are nutritive, and accordingly uſed for food; but rarely for any medicinal purpoſes, except to keep iſſues open; for which purpoſe they are rubbed with baſilicon, or linimentum Arcæi.

PITCH, a tenaceous oily ſubſtance, drawn chiefly from pines and firs, and uſed in ſhipping, medicine, and various other arts: or it is more properly tar, inſpiſſated by boiling it over a ſlow fire.

The method of procuring the tar, is by cleaving the trees into ſmall billets, which are laid in a furnace that has two apertures, through one of which the fire is put, and through the other the pitch is gathered, which, ouzing from the wood, runs along the bottom of the furnace into places made to receive it. When the ſmoke, which is here very thick, gives it blackneſs, this is called tar; which, on being boiled, to conſume more of its moiſture, becomes pitch.

There is another method of drawing pitch, uſed in the Levant: a pit is dug in the ground, two ells in diameter at the top, but contracting as it grows deeper; this is filled with branches of pine, cloven into ſhivers; the wood at the top of the pit is then ſet on fire, and burning downwards, the tar runs from it out of a hole made in the bottom; and this is boiled, as above, to give it the conſiſtence of pitch.

PITH, in vegetation, the ſoft ſpungy ſubſtance contained in the central parts of plants and trees. See AGRICULTURE, Part I.

PITUITARY GLAND, in anatomy. See ANATOMY, p. 286.

PLACE, in war, a general name for all kinds of fortreſſes where a party may defend themſelves.

Common PLACE. See COMMON PLACE.

PLACENTA, in anatomy and midwifery, a ſoft roundiſh maſs found in the womb of pregnant women; which, from its reſemblance to the liver, was called by the ancients hepar uterinum, the uterine liver. See MIDWIFERY, p. 208.

PLACENTIA, a city of Spain, in the province of Eſtremadura: W. long. 6°, N. lat. 39° 45′.

PLAGIARY, in philology, the purloining another perſon's works, and putting them off for a man's own. Among the Romans, plagiarius was properly a perſon who bought, ſold, or retained a freeman for a ſlave; and was ſo called, becauſe by the Flavian law ſuch perſons were condemned, ad plagas, to be whipped.

PLAGIURI, among ichthyologiſts, a claſs of fiſhes comprehending all thoſe which have the tails not perpendicular, but placed in an horizontal direction.

PLAGUE, PESTILENCE, or PESTILENTIAL FEVER. See MEDICINE, p. 71.

PLAISE, the Engliſh name of a ſpecies of the pleuronectes. See PLEURONECTES.

PLAN, in general, denotes the repreſentation of ſomething drawn on a plane: ſuch are maps, charts, ichnographies, *&c.*

The term plan, however, is particularly uſed for a draught of a building, ſuch as it appears, or is intended to appear, on the ground; ſhewing the extent, diviſion, and diſtribution of its area, or ground-plot, into apartments, rooms, paſſages, *&c.*

PLANE, in geometry, denotes a plain ſurface, or one that lies evenly between its bounding lines: and as a right line is the ſhorteſt extenſion from one point to another, ſo a plain

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plain ſurface is the ſhorteſt extenſion from one line to another.

PLANE, in joinery, an edged tool, or inſtrument for parting and ſhaving of wood ſmooth.

It conſiſts of a piece of wood, very ſmooth at bottom, as a ſtock or ſhaft; in the middle of which is an aperture, through which a ſteel edge, or chiſſel, placed obliquely, paſſes; which being very ſharp, takes off the inequalities of the wood it is ſlid along.

PLANE-TREE, in botany. See PLATANUS.

PLANET, a celeſtial body, revolving round the ſun as a centre, and continually changing its poſition, with reſpect to the fixed ſtars; whence the name *planet*, which is a Greek word, ſignifying *wanderer*. See ASTRONOMY.

PLANETARIUM, the ſame with orrery. See ASTRONOMY, p. 495.

PLANIMETRY, that part of geometry which conſiders lines and plain figures, without conſidering their height or depth. See GEOMETRY.

PLANISPHERE, ſignifies a projection of the ſphere, and its various circles on a plane; in which ſenſe maps, wherein are exhibited the meridians, and other circles of the ſphere, are planiſpheres.

PLANT, is defined to be an organical body, deſtitute of ſenſe and ſpontaneous motion, adhering to another body in ſuch a manner as to draw from it its nouriſhment, and having power of propagating itſelf by ſeeds. See AGRICULTURE and BOTANY.

Senſitive PLANT. See MIMOSA.

PLANTA, in anatomy, the foot. See ANATOMY, p. 185.

PLANTAGO, in botany, a genus of the tetrandria monogynia claſs. The calix and corolla has each four ſegments; the ſtamina are very long; and the capſule is bilocular. There are 21 ſpecies, eight of them natives of Britain.

The root, leaves, and ſeeds of plaintain, are reckoned cooling and aſtringent. It is likewiſe accounted a great healer of freſh wounds.

Water PLAINTAIN. See RANUNCULUS.

PLANTARIS, in anatomy. See ANATOMY, p. 210.

PLANTATION, in the Weſt-Indies, denotes a ſpot of ground which a planter or perſon arrived in a new colony, pitches on to cultivate for his own uſe, or is aſſigned for that purpoſe. However, the term plantation is often uſed in a ſynonymous ſenſe with colony.

PLASTER, in pharmacy, is defined to be an external application, of a harder conſiſtence than our ointments; theſe are to be ſpread according to the different circumſtances of the wound, place, or patient, either upon linnen or leather.

PLASTER, among builders, *&c.* The plaſter of Paris is a preparation of ſeveral ſpecies of gypſums, dug near Mont Maitre, a village in the neighbourhood of Paris; whence the name.

The beſt ſort is hard, white, ſhining, and marbly; known by the names of plaſter-ſtone, or parget of Mount Maitre. It will neither give fire with ſteel, nor ferment with aqua fortis; but very freely and readily calcines in the fire, into a very fine plaſter; the uſe of which in building, and caſting ſtatues, is well known.

PLASTIC, denotes a thing endued with a formative power, or a faculty of forming or faſhioning a maſs of matter, after the likeneſs of a living being; ſuch a virtue as ſome of the ancient Epicureans, and perhaps the Peripatetics too, imagined to reſide in the earth, or at leaſt to have anciently reſided therein, by means whereof, and without any extraordinary intervention of a creator, it put forth plants, *&c.* Some of them ſeem to be of opinion, that animals, and even man himſelf, was the effect of this plaſtic power.

PLASTIC ART, a branch of ſculpture, being the art of forming figures of men, birds, beaſts, fiſhes, *&c.* in plaſter, clay, ſtuc, or the like.

PLATA, a ſmall iſland in the Pacific ocean, near the coaſt of Peru, ſituated W. long. 81°, S. lat. 1°. It is alſo the name of a city of Peru, capital of the province of La Plata, ſituated in W. long. 66° 30′, S. lat. 22° 30′: and alſo the name of a great river of Peru, which riſing in the province of La Plata, and running ſouth-eaſt till it joins the river Paragua, diſcharges itſelf into the Atlantic ocean, below the city of Buenos Ayres.

PLATALEA, or ſpoon-bill, in ornithology, a genus belonging to the order of grallæ. The beak is plain, and dilates toward the point into an orbicular form; the feet have three toes, and are half palmated. There are three ſpecies, diſtinguiſhed by their colour.

PLATANUS, the PLANE-TREE, in botany, a genus of the monœcia polyandria claſs. The calix both of the male and female is a roundiſh amentum; the male has no corolla; the corolla of the female conſiſts of many petals; the ſtigma is bent backward; and the ſeeds are round. The ſpecies are two, none of them natives of Britain.

PLATBAND, in gardening, a border or bed of flowers along a wall, or the ſide of a parterre frequently edged with box, *&c.*

PLATBAND of a door or window is uſed for the lintel, where that is made ſquare or not much arched.

PLATFORM, in the military art, an elevation of earth, on which cannon is placed, to fire on the enemy; ſuch are the mounts in the middle of curtains.

PLATFORM, in architecture, is a row of beams, which ſupport the timber-work of a roof, and lie on the top of the wall, where the entablature ought to be raiſed.

PLATONIC, ſomething that relates to Plato, his ſchool-philoſophy, opinions, or the like.

PLATONIC YEAR, or the GREAT YEAR, is a period of time determined by the revolution of the equinoxes. See ASTRONOMY, p. 562.

PLATOON, in the military art, a ſmall ſquare body of forty or fifty men, drawn out of a battalion of foot, and placed between the ſquadrons of horſe, to ſuſtain them.

PLATYSMA MYOIDES, in anatomy. See ANATOMY, p. 195.

PLEA, in law, is what either party alledges for himſelf in court, in a cauſe there depending; and in a more reſtrained ſenſe, it is the defendant's anſwer to the plaintiff's declaration.

Court of Common PLEAS. See COMMON-PLEAS.

PLEASURE and pain, ſays Mr Locke, are ſimple ideas, which we receive both from ſenſation and reflection; there being thoughts of the mind, as well as ſenſations, accompanied with pleaſure or pain. See METAPHYSICS.

PLEBEIAN, any perſon of the rank of the common people. It is chiefly uſed in ſpeaking of the ancient Romans, who were divided into ſenators, knights, and plebeians.

PLEDGE,

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PLEDGE, in Scots law. See LAW, Tit. xx. 13.

PLEDGET, BOLSTER, or COMPRESS, in ſurgery, a kind of flat tent, laid over a wound, to imbibe the ſuperfluous humours, and keep it clean.

PLEIADES, in aſtronomy, an aſſemblage of ſtars in the neck of the conſtellation taurus. See ASTRONOMY, p. 487.

PLENARY, ſomething complete or full.

PLENIPOTENTIARY, a perſon veſted with full power to do any thing. See EMBASSADOR.

PLENITUDE, the quality of a thing that is full, or that fills another. In medicine, it chiefly denotes a redundancy of blood and humours.

PLENUM, in phyſics, denotes, according to the Carteſians, that ſtate of things, wherein every part of ſpace is ſuppoſed to be full of matter; in oppoſition to a vacuum.

PLEONASM, a figure in rhetoric, whereby we uſe words ſeemingly ſuperfluous, in order to expreſs a thought with the greater energy: ſuch as, I ſaw it with my own eyes, *&c.*

PLETHORA, in medicine, a greater redundance of laudable blood and humours than is capable of undergoing thoſe changes which muſt neceſſarily happen for the purpoſes of life without inducing diſeaſes.

PLEURA, in anatomy. See ANATOMY, p. 278.

PLEURISY, in medicine. See MEDICINE, p. 89.

PLEURONECTES, in ichthyology, a genus belonging to the order of thoracici. Both eyes are on the ſame ſide of the head; there are from four to ſeven rays in the gill-membrane; the body is compreſſed, the one ſide reſembling the back and the other the belly. There are 17 ſpecies.

PLEXUS, among anatomiſts, a bundle of ſmall veſſels interwoven in the form of net-work.

PLIMOUTH, or PLYMOUTH, a port-town of Devonſhire, and a ſtation for the building and laying up of ſhips of war belonging to the royal navy: W. long. 4° 27′, N. lat. 50° 26′. It ſends two members to parliament.

PLIMTON, a borough town of Devonſhire, ſituated near the Engliſh Channel, thirty-ſix miles ſouth-weſt of Exeter. It ſends two members to parliament.

PLINIA, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of five petals, and the calix of five ſegments; the berry is furrowed, and contains one ſeed. There is but one ſpecies, a native of America.

PLINTH, in architecture, a flat ſquare member, in the form of a brick.

PLOCSKOW, the capital of a palatinate of the ſame name, in Poland fifty miles north-weſt of Warſaw.

PLOT, in dramatic poetry, is ſometimes uſed for the fable of a tragedy or comedy, but more particularly the knot or intrigue, which makes the embarras of any piece.

PLOT, in ſurveying, the plan or draught of any field, farm, or manor ſurveyed with an inſtrument, and laid down in the proper figure and dimenſions.

PLOTTING, among ſurveyors, is the art of laying down on paper, *&c.* the ſeveral angles and lines of a tract of ground ſurveyed by a theodolite, *&c.* and a chain. See GEOMETRY.

PLOVER, in ornithology. See CHARADRIUS.

PLOUGH, in agriculture, a machine for turning up the ſoil, contrived to ſave the time, labour, and expence, that without this inſtrument muſt have been employed in digging land, to prepare it for the ſowing of all kinds of grain. See AGRICULTURE, p. 54.

PLOUGHMAN, the perſon who guides the plough in the operation of tilling.

PLOUGHING, in agriculture, turning up the earth with a plough. See AGRICULTURE, p. 57.

PLUKNETIA, in botany, a genus of the monœcia monodelphia claſs. Neither the male nor the female have any calix; the corolla of each has four petals; the male has four glandular bearded nectaria; the ſtylus is filiform; the ſtigma is peltated; and the capſule has four cells, containing one ſeed. There is but one ſpecies, a native of India.

PLUM-TREE, in botany. See PRUNUS.

PLUMAGE, the feathers which ſerve birds for a covering.

PLUMB-LINE, among artificers, denotes a perpendicular to the horizon; ſo called, as being commonly erected by means of a plummet.

PLUMBAGO, in botany, a genus of the pentandria monogynia claſs. The corolla is bell-ſhaped; the ſtamina are inſerted into ſcales at the baſe of the corolla; the ſtigma is quinquefid; and there is but one oblong truncated ſeed. The ſpecies are four, none of them natives of Britain.

PLUMBERY, the art of caſting and working lead, and uſing it in buildings, *&c.*

As this metal melts very eaſily, it is eaſy to caſt it into figures of any kind, by running it into moulds of braſs, clay, plaſter, *&c.* But the chief article in plumbery is ſheets and pipes of lead: and as theſe make the baſis of the plumber's work, we ſhall here give the proceſs of making them. In caſting ſheet-lead, a table or mould is made uſe of, which conſiſts of large pieces of wood well jointed, and bound with bars of iron at the ends, on the ſides of which runs a frame conſiſting of a ledge, or border of wood, two or three inches thick, and two or three inches high from the mould, called the ſharps; the ordinary width of the mould, within theſe ſharps, is from three to four feet; and its length is ſixteen, ſeventeen, or eighteen feet. This ſhould be ſomething longer than the ſheets are intended to be, in order that the end where the metal runs off from the mould may be cut off, becauſe it is commonly thin or uneven, or ragged at the end. It muſt ſtand very even or level in breadth, and ſomething falling from the end in which the metal is poured in, *viz.* about an inch, or an inch and a half, in the length of ſixteen or ſeventeen inches. At the upper end of the mould ſtands the pan, which is a concave triangular priſm, compoſed of two planks nailed together at right angles, and two triangular pieces fitted in between them at the ends. The length of this pan is the whole breadth of the mould in which the ſheets are caſt: it ſtands with its bottom, which is a ſharp edge, on a form at the end of the mould, leaning with one ſide againſt it; and on the oppoſite ſide is a handle to lift it up by, to pour out the melted lead; and on that ſide of the pan next the mould, are two iron hooks to take hold of the mould, and prevent the pan from ſlipping, while the melted lead is pouring out of it into the mould. This pan is lined on the inſide with moiſtened ſand, to prevent it from being fired by the hot metal. The mould is alſo ſpread over, about two thirds of an inch thick, with ſand ſifted and moiſtened

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ened, which is rendered perfectly level by moving over it a piece of wood called a ſtrike, by trampling upon it with the feet, and ſmoothing it over with a ſmoothing plane, which is a thick plate of poliſhed braſs, about nine inches ſquare, turned up on all the four edges, and with a handle fitted on to the upper or concave ſide. The ſand being thus ſmoothed, it is fit for caſting ſheets of lead: but if they would caſt a ciſtern, they meaſure out the bigneſs of the four ſides; and having taken the dimenſions of the front, or fore-part, make mouldings by preſſing long ſlips of wood, which contain the ſame mouldings, into the level ſand, and form the figures of birds, beaſts, &c. by preſſing in the ſame manner leaden figures upon it, and then taking them off, and at the ſame time ſmoothing the ſurface where any of the ſand is raiſed up, by making theſe impreſſions upon it. The reſt of the operation is the ſame in caſting either ciſterns or plain ſheets of lead: but before we proceed to mention the manner in which that is performed, it will be neceſſary to give a more particular deſcription of the ſtrike. The ſtrike then is a piece of board about five inches broad, and ſomething longer than the breadth of the mould on the inſide; and at each end is cut a notch, about two inches deep, ſo that when it is uſed, it rides upon the ſharps with thoſe notches. Before they begin to caſt, the ſtrike is made ready by tacking on two pieces of an old hat on the notches, or by ſlipping a caſe of leather over each end. in order to raiſe the under ſide about one eighth of an inch, or ſomething more, above the ſand, according as they would have the ſheet to be in thickneſs; then they tallow the under edge of the ſtrike, and lay it acroſs the mould. The lead being melted, it is laddled into the pan, in which, when there is a ſufficient quantity for the preſent purpoſe, the ſcum of the metal is ſwept off with a piece of board to the edge of the pan. letting it ſettle on the ſand, which is by this means prevented from falling into the mould at the pouring out of the metal. When the lead is cool enough, which is known by its beginning to ſtand with a ſhell or wall on the ſand round the pan, two men take the pan by the handle, or elſe one of them lift it up by a bar and chain fixed to a beam in the ceiling, and pour it into the mould, while another man ſtands ready with the ſtrike, and, as ſoon as they have done pouring in the metal, puts on the mould. ſweeps the lead forward, and draws the overplus into a trough prepared to receive it. The ſheets being thus caſt, nothing remains but to planiſh the edges in order to render them ſmooth and ſtraight; but if it be a ciſtern, it is bent into four ſides, ſo that the two ends may join the back, where they are ſoldered together, after which the bottom is ſoldered up.

The method of caſting thin ſheets of lead. Inſtead of ſand, they cover the mould with a piece of woolen ſtuff nailed down at the two ends to keep it tight, and over this lay a very fine linen cloth. In this proceſs great regard is had to the juſt degree of heat. ſo as that the lead may run well, and yet not burn the linen. This they judge of by a piece of paper; for it takes fire in the liquid lead if it is too hot, and if it be not ſhrunk and ſcorched a little, it is not hot enough. They have here a ſtrike different from that deſcribed above: it is a wooden caſe, only cloſed on three ſides: it is pretty high behind; but the two ſides, like two acute angles, ſtill diminiſh to the tip from the place where they are joined to the third or middle piece, where they are of the ſame height therewith, *viz.* ſeven or eight inches high, the width of the middle makes that of the ſtrike, which again makes that of the ſheet to the caſt. This ſtrike is placed at the top of the mould, which in that part is firſt covered with a paſteboard that ſerves as a bottom to the caſe, and prevents the linen from being burnt while the lead is pouring in. The ſtrike is now filled with lead, according to the quantity to be uſed; which done, two men, one at each ſide, draw the ſtrike down the mould with a velocity greater or leſs, as the ſheet is to be more or leſs thick.

The method of caſting pipes without ſoldering. To make theſe pipes, they have a kind of little mill, with arms or levers to turn it withal. The moulds are of braſs, and conſiſt of two pieces, which open and ſhut by means of hooks and hinges, their inward caliber, or diameter, being according to the ſize of the pipe to be made, and their length is uſually two feet and a half. In the middle is placed a core, or round piece of braſs or iron, ſomewhat longer than the mould, and of the thickneſs of the inward diameter of the pipe. This core is paſſ d through two copper-rundles, one at each end of the mould, which they ſerve to cloſe; and to theſe is joined a little copper-tube about two inches long, and of the thickneſs the leaden pipe is intended to be of. By means of theſe tubes the core is retained in the middle of the cavity of the mould. The core being in the mould, with the rundles at its two ends, and the lead melted in the furnace, they take it up in a ladle and pour it into the mould by a little aperture at one end, made in the form of a funnel. When the mould is full they paſs a hook into the end of the core, and turning the mill, draw it out; and then opening the mould, take out the pipe. If they deſire to have the pipe lengthened, they put one end of it in the lower end of the mould, and paſs the end of the core into it; then ſhut the mould again, and apply its rundle and tube as before, the pipe juſt caſt ſerving for rundle, &c. at the other end. Things being thus replaced, they pour in freſh metal, and repeat the operation till they have got a pipe of the length required.

For making pipes of ſheet-lead, the plumbers have wooden cylinders of the length and thickneſs required; and on theſe they form their pipes by wrapping the ſheet around them, and ſoldering up the edges all along them.

PLUMBUM, LEAD. See CHEMISTRY, p. 84.

PLUME, in botany See AGRICULTURE, p. 41.

PLUMMET, PLUMB RULE, or PLUMB LINE, an inſtrument uſed by carpenters, maſons, &c. in order to judge whether walls, &c. be upright planes, horizontal, or the like. It is thus called from a piece of lead, faſtened to the end of a cord, which uſually conſtitutes this inſtrument. Sometimes the ſtring deſcends along a wooden ruler, &c. raiſed perpendicularly on another; in which caſe it becomes a level.

PLUMMING, among miners, is the method of uſing a mine-dial, in order to know the exact place of the work where to ſink down an air-ſhaft, or to bring an adit to the work, or to know which way the load inclines when any flexure happens in it.

It is performed in this manner: A ſkilful perſon, with an aſſiſtant, and with pen, ink, and paper, and a long line, and a ſun-dial, after his gueſs of the place above ground, deſcends into the adit or work, and there faſtens one end of the line to ſome fixed thing in it; then the incited needle

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is let to reſt, and the exact point where it reſts is marked with a pen: he then goes on farther in the line ſtill faſtened, and at the next flexure of the adit he makes a mark on the line by a knot or otherwiſe; and then letting down the dial again, he there likewiſe notes down that point at which the needle ſtands in this ſecond poſition. In this manner he proceeds, from turning to turning, marking down the points, and marking the line, till he comes to the intended place: this done, he aſcends, and begins to work on the ſurface of the earth what he did in the adit, bringing the firſt knot in the line to ſuch a place where the mark of the place of the needle will again anſwer its pointing, and continues this till he come to the deſired place above ground, which is certain to be perpendicularly over the part of the mine into which the air-ſhaft is to be ſunk.

PLUMOSE, ſomething formed in the manner of a feather, with a ſtem and fibres iſſuing from it on each ſide; ſuch are the antennæ of certain moths, butterflies, *&c.*

PLURAL, in grammar, an epithet applied to that number of nouns and verbs which is uſed when we ſpeak of more than one thing. See GRAMMAR.

PLURALITY, a diſcrete quantity, conſiſting of two or a greater number of the ſame kind; thus we ſay a plurality of gods, *&c.*

PLUS, in algebra, a character marked thus +, uſed for the ſign of addition.

PLUSH, in commerce, *&c.* a kind of ſtuff having a ſort of velvet knap, or ſhag, on one ſide, compoſed regularly of a woof of a ſingle woolen thread, and a double warp; the one wool, of two threads twiſted; the other goats or camels hair; though there are ſome pluſhes entirely of worſted, and others compoſed wholly of hair.

PLUVIALIS, in zoology. See CHARADRIUS.

PNEUMATICS.

THIS ſcience treats of the nature, weight, and preſſure of the air, and the effects ariſing from it.

The air is that thin tranſparent fluid body in which we live and breathe. It encompaſſes the whole earth to a conſiderable height; and, together with the clouds and vapours that float in it, is called the atmoſphere. The air is juſtly reckoned among the number of fluids, becauſe it has all the properties by which a fluid is diſtinguiſhed. (See HYDROSTATICS.) For it yields to the leaſt force impreſſed, its parts are eaſily moved among one another, it preſſes according to its perpendicular height, and its preſſure is every way equal.

That the air is a fluid, conſiſting of ſuch particles as have no cohæſion betwixt them, but eaſily glide over one another, and yield to the ſlighteſt impreſſion, appears from that eaſe and freedom with which animals breathe in it, and move through it without any difficulty or ſenſible reſiſtance.

But it differs from all other fluids in the three following particulars. It can be compreſſed into a leſs ſpace than what it naturally poſſeſſeth, which no other fluid can. 2. It cannot be congealed or fixed, as other fluids may. 3. It is of a different denſity in every part, upward from the earth's ſurface, decreaſing in its weight, bulk for bulk, the higher it riſes; and therefore muſt alſo decreaſe in denſity. 4. It is of an elaſtic or ſpringy nature, and the force of its ſpring is equal to its weight.

That air is a body, is evident from its excluding all other bodies out of the ſpace it poſſeſſes; for, if a glaſs jar be plunged with its mouth downward into a veſſel of water, there will but very little water get into the jar, becauſe the air of which it is full keeps the water out.

As air is a body, it muſt needs have gravity or weight: and that it is weighty, is demonſtrated by experiment. For, let the air be taken out of a veſſel by means of the air-pump; then, having weighed the veſſel, let in the air again; and upon weighing it, when re-filled with air, it will be found conſiderably heavier. Thus, a bottle that holds a wine quart, being emptied of air, and weighed, is found to be about 17 grains lighter than when the air is let into it again; which ſhews that a quart of air weighs 17 grains. But a quart of water weighs 14625 grains; this divided by 17, quotes 860 in round numbers; which ſhews, that water is 860 times as heavy as air near the ſurface of the earth.

As the air riſes above the earth's ſurface, it grows rarer, and conſequently lighter, bulk for bulk. For ſince it is of an elaſtic or ſpringy nature, and its lowermoſt parts are preſſed with the weight of all that is above them, it is plain that the air muſt be more denſe or compact at the earth's ſurface, than at any height above it; and gradually rarer the higher up. For, the denſity of the air is always as the force that compreſſeth it: and therefore, the air towards the upper parts of the atmoſphere being leſs preſſed than that which is near the earth, it will expand itſelf, and thereby become thinner than at the ſurface of the earth.

Dr Cotes has demonſtrated, that if altitudes in the air be taken in arithmetical proportion, the rarity of the air will be in geometrical proportion. For inſtance,

At the altitude of miles above the ſurface of the earth, the air is times thinner and lighter than at the earth's ſurface.	
7	4
14	16
21	64
28	256
35	1024
42	4096
49	16384
56	65536
63	262144
70	1048576
77	4194304
84	16777216
91	67108864
98	268435456
105	1073741824
112	4294967296
119	17179869184
126	68719476736
133	274877906944
140	1099511627776

And hence it is eaſy to prove by calculation, that a cubic inch of ſuch air as we breathe, would be ſo much rarefied at the altitude of 500 miles, that it would fill a ſphere equal in diameter to the orbit of Saturn.

The

The weight or preſſure of the air is exactly determined by the following experiment.

The TORICELLIAN EXPERIMENT.

Take a glaſs tube about three feet long, and open at one end: fill it with quickſilver; and putting your finger upon the open end, turn that end downward, and immerſe it into a ſmall veſſel of quickſilver, without letting in any air: then take away your finger, and the quickſilver will remain ſuſpended in the tube 29½ inches above its ſurface in the veſſel; ſometimes more, and at other times leſs, as the weight of the air is varied by winds and other cauſes. That the quickſilver is kept up in the tube by the preſſure of the atmoſphere upon that in the baſon, is evident; for, if the baſon and tube be put under a glaſs, and the air be then taken out of the glaſs, all the quickſilver in the tube will fall down into the baſon; and if the air be let in again, the quickſilver will riſe to the ſame height as before. Therefore the air's preſſure on the ſurface of the earth, is equal to the weight of 29½ inches depth of quickſilver all over the earth's ſurface, at a mean rate.

A ſquare column of quickſilver, 29½ inches high, and one inch thick, weighs juſt 15 pounds, which is equal to the preſſure of air upon every ſquare inch of the earth's ſurface; and 144 times as much, or 2160 pounds, upon every ſquare foot; becauſe a ſquare foot contains 144 ſquare inches. At this rate, a middle-ſized man, whoſe ſurface may be about 14 ſquare feet, ſuſtains a preſſure of 30240 pounds, when the air is of a mean gravity: a preſſure which would be inſupportable, and even fatal to us, were it not equal one very part, and counterbalanced by the ſpring of the air within us, which is diffuſed through the whole body, and re-acts with an equal force againſt the outward preſſure.

Now ſince the earth's ſurface contains (in round numbers) 200,000,000 ſquare miles, and every ſquare mile 27,878,400 ſquare feet, there muſt be 5,575,680 000,000,000 ſquare feet on the earth's ſurface; which multiplied by 2160 pounds (the preſſure on each ſquare foot) gives 12,043,468,800 000,000,000 pounds for the preſſure or weight of the whole atmoſphere.

When the end of a pipe is immerſed in water, and the air is taken out of the pipe, the water will riſe in it to the height of 33 feet above the ſurface of the water in which it is immerſed; but will go no higher: for it is found, that a common pump will draw water no higher than 33 feet above the ſurface of the well: and unleſs the bucket goes within that diſtance from the well, the water will never get above it. Now, as it is the preſſure of the atmoſphere, on the ſurface of the water in the well, that cauſes the water to aſcend in the pump, and follow the piſton or bucket, when the air above it is lifted up; it is evident, that a column of water 33 feet high, is equal in weight to a column of quickſilver of the ſame diameter 29½ inches high; and to as thick a column of air, reaching from the earth's ſurface to the top of the atmoſphere. See HYDROSTATICS.

OF THE BAROMETER.

IN ſerene calm weather, the air has weight enough to ſupport a column of quickſilver 31 inches high; but in tempeſtuous ſtormy weather, not above 28 inches. The quickſilver, thus ſupported in a glaſs tube, is found to be a nice counterbalance to the weight or preſſure of the air, and to ſhew its alterations at different times. And being now generally uſed to denote the changes in the weight of the air, and of the weather conſequent upon them, it is called the *barometer*, or weather-glaſs.

The mercury will ſtand at the ſame height either in an inclined barometer or in an erect one.

If the mercury at any time ſtands at the height of 30 inches in the barometer D, (Plate CXLV. fig. 6.) then by inclining this barometer into the poſition E, the perpendicular height of the mercury will not be altered; for it will ſtill ſtand at the height of 30 inches: ſo that if the level AB is 30 inches from the ſurface FG, the mercury will ſtand at this level, either in the erect tube D, or in the inclined one E. Now here it is evident, that if NL is the height of the mercury when the tube is erect, and NM is the height of the mercury in the ſame tube or an equal one when it is inclined, there muſt be more mercury in the inclined tube than there is in the erect one. For we may conſider NL as the ſide, and NM as the diagonal, of a right-angled parallelogram. But the diagonal of a right angled parallelogram is longer than the ſide. Therefore, though either L or M are at the ſame perpendicular diſtance from FG, yet NM will be longer than NL. Since then the column of mercury is longer in the inclined tube than in the erect one, there will be more mercury in the inclined than in the erect one. The queſtion therefore is, How the preſſure of the atmoſphere can ſupport a greater quantity of matter in one ſituation of the tube than in the other. We cannot ſay, that though in the inclined tube there is a greater quantity of mercury than in the erect one, yet a part of this greater weight will be ſupported by the ſide of the tube as by an inclined plane. The true anſwer is, that the column of air which ſupports the mercury in the inclined tube, is greater than the column which ſupports it in the erect one. The height of the column of air is indeed the ſame in both caſes; for in either caſe it is equal to the height of the atmoſphere. But the baſe of the column of air, and conſequently its weight, is greater when the tube is inclined than when it is erect. For the baſe of the column of air which ſupports the mercury in the tube, is equal to as much of the ſtagnant mercury's ſurface as the baſe of the tube covers. Now, if the diameters of the tubes D and E are equal; the baſe of the inclined tube E will cover a greater part of the ſurface FG than the erect tube D covers, or the baſe of the tube E will be greater than the baſe of the tube D. For the contents of the inclined tube are greater than thoſe of the erect one, as has been ſhewn already. But the column of mercury in each of the tubes are cylinders of the ſame height. Therefore their baſes are as their contents. Euc. b. XII. prop. 11. Since then the contents or the weights of mercury in each tube are as their baſes, when their heights are equal; and the baſe of the column of air, which ſupports the mercury, and conſequently the weight of this column, is proportional to the baſe of the tube; it follows, that the weight of the air will always be proportional to the weight of the mercury when it ſtands at a given height, whether the tube is inclined or erect.

Though we have here ſhewn, that the contents of the inclined tube are greater than thoſe of the erect one, and conſequently that their baſes muſt be unequal, ſince their perpendicular heights are the ſame; yet it will not be improper to ſhew what we mean by the baſe of the inclined tube, or rather of the inclined column of mercury, and why this ſhould be greater than the baſe of the erect one. Now by the

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the baſe of the inclined column we do not mean the bottom of the inclined tube, but the loweſt horizontal ſection of it. Thus, if we conſider the ſurface FG as a plane paſſing through the two tubes D and E, this plane will cut the tube D perpendicularly, and the tube E obliquely. But a perpendicular ſection of a cylinder is a circle, and an oblique ſection of it is an ellipſis. Therefore the baſe of the erect column is circular, and the baſe of the inclined tube is elliptical. Now, by the ſuppoſition, the two tubes have equal diameters, and conſequently the ſhorter axis of the elliptical baſe will be equal to the diameter of the circular one.

There is another ſort of inclined barometer, ſuch an one as ABR, (*ibid.* fig. 7.) which is erect for 28 inches from A to B, and then is inclined from B to C. The mercury will ſtand at the ſame height in this barometer, as if it had been a ſtrait one AS: for the column of air preſſing at the baſe A would be the ſame in either caſe: and though there is more mercury in the tube ABR than there would be in the tube ABS: yet, ſuppoſing the mercury to ſtand at the ſame level DC in either caſe, the preſſure of the mercury downwards will in either caſe be the ſame. For, the preſſure of fluids is as their baſe and perpendicular height: and here the baſe A is the ſame, and the perpendicular height is the ſame, whether the tube is erect all the way up as AS, or is inclined at the top as ABR.

The advantage which is propoſed by theſe diagonal barometers, as they are called, is to make the variation of the mercury greater, and conſequently more apparent, upon a given change in the weather. Thus ſuppoſe AB or 28 inches to be the leaſt height of the mercury, and AD or 31 inches to be the greateſt height of it: then the whole variation will be within the compaſs BD, or 3 inches. But if the barometer, inſtead of being erect at the top, is inclined into the poſition BC; then, as the mercury ſtands at the ſame perpendicular height in this diagonal barometer as in an erect one, AB will be the leaſt height, and ABC will be the greateſt height, ſince D and C are on the ſame level or at the ſame perpendicular diſtance from A. Now though BD, one ſide of the parallelogram, is but 3 inches long; yet BC may be 30 inches long, or more; and conſequently ſince AB is the leaſt height, and ABC is the greateſt height, the variation of the mercury will be much greater than in an erect barometer; in particular, if BC is 30 inches long, the variation will be 30 inches inſtead of 3, or will be 10 times greater in the diagonal barometer than it would have been in an erect one.

The barometer ſtands at the ſame perpendicular height, whether the tube is large or ſmall.

If the mercury ſtands at the ſame height either in the large tube C or in the ſmall tube D, there muſt be more mercury in the large one than in the ſmall one. But ſince the heights are equal, the quantities of mercury contained in theſe tubes will be as their baſes. Now ſince the columns of air, by which the mercury is ſupported in theſe tubes, are as the reſpective baſes of the tubes, the columns of air will be proportional to the weights in each tube, when the perpendicular heights are equal.

But though the heights of the mercury would be the ſame in ſmall tubes as in large ones, if, as we muſt ſuppoſe in the propoſition, the mercury moved equally free in both; yet in fact, upon any change of weather, the variation will be greater in a large tube than in a ſmall one: becauſe, in a large tube, the weight of mercury is ſo great, that the motion of it will not be hindered by any attraction or repulſion of the glaſs upon it; whereas, in a ſmall tube, where the weight of mercury is leſs, the action of the glaſs is conſiderable in proportion to that weight, and conſequently the variations will be leſs upon a given change of the weather.

The barometer will commonly be low in rainy weather.

From what has been ſaid already about the barometer, it appears, that the mercury will be low when the weight of the atmoſphere is diminiſhed; and ſuch a diminution of the atmoſphere will occaſion rain. Therefore, ſince rain is occaſioned by the ſame cauſe that makes the mercury fall, the barometer will commonly ſtand low in rainy weather.

The barometer is the loweſt of all in violent ſtorms of wind.

When the air moves horizontally with a great velocity, as it does in violent ſtorms of wind, its weight, or rather its preſſure downwards occaſioned by its weight, will be diminiſhed. For as any heavy body may have ſuch a velocity given it, when it is thrown down horizontally, as may either carry it quite off from the earth's centre, or ſuch a velocity as will make it move round the earth in a circle without either departing from the centre or approaching to it; ſo every degree of velocity given to the air will make it tend or preſs leſs towards the centre; and for this reaſon, as the mercury in the baſon will be leſs preſſed, the height of it in the tube will be leſs in ſtorms than it is any other time.

When a ſtorm of wind is over, the mercury will riſe very faſt:

Becauſe as the horizontal velocity of the air ceaſes, the preſſure downwards will be ſuddenly reſtored, and conſequently the mercury in the barometer will keep riſing as this preſſure is reſtored.

Of the THERMOMETER.

The variations of different thermometers are ſeldom equal, upon equal variations of heat or cold.

A THERMOMETER is a well-known inſtrument for eſtimating different degrees of heat or cold. It conſiſts of a tube or ſtem, with a hollow ball at one end of it. The cavity of the ball, and part of the tube, is filled with ſpirits of wine, or with linſeed oil, or with mercury. The upper end of the tube is commonly ſealed hermetically. But in ſealing this end, the liquor in the thermometer is rarefied by heating it till it almoſt fills the tube; ſo that when it is ſealed, and the liquor contracts again as it cools, there will be a vacuum left in the upper part of the tube. Any of theſe fluids will rarefy by heat, and will contract again when they cool: and conſequently in warm weather, the ſpirits, or the oil, or the mercury, whichever the thermometer is made of, will ſtand higher than in cold weather.

Thus far thermometers may be ſaid to vary alike: they will either riſe or ſink from the ſame cauſes. But then, upon an equal increaſe of heat, they ſeldom vary equally, though they are made of the ſame liquor. One thermometer made with ſpirits of wine may vary upon an equal increaſe of heat much more than another that is made with the ſame ſort of ſpirits: ſo that if one riſes an inch, another may riſe but $\frac{1}{2}$ or $\frac{1}{4}$ inch.

The variation of a thermometer is directly as the capacity of

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of the ball, and inverſely as the baſe of the ſtem. First, If the baſe of the ſtem or cylindrical tube is given, the variation, when the ſpirits are equally warmed, will be directly as the capacity of the ball. For when the ſpirits are equally warmed, and conſequently are equally rarefied in the balls of two different thermometers, whatever proportion the bulk of the ſpirits in one ball bears to the bulk of the ſpirits in the other ball before they were rarefied, the ſame proportion theſe bulks will ſtill bear to each other after they are rarefied. Thus, if one ball is double the other, and conſequently the bulk of ſpirits in one is double the bulk of ſpirits in the other before they are warmed; then, upon being warmed equally, their denſities will diminiſh equally. But if their denſities diminiſh equally, their bulks will ſtill have the ſame proportion to each other; or the bulk of ſpirits in one thermometer will ſtill be double the bulk in the other. But if the bulks continue in the ſame proportion to each other, after they are ſwelled as they were before; the ſpirits muſt ſwell in proportion to their reſpective bulks, or the ſpirits in one muſt ſwell twice as much as in the other. But if the ſpirits ſwell in this proportion, and by ſwelling riſe into equal tubes in each, they muſt riſe twice as high in the tube of one of theſe thermometers as they do in the tube of the other. And ſo, in all other inſtances, the ſpirits, upon being equally warmed, will ſwell in proportion to their bulk, that is, in proportion to the capacity of the ball that contains them. But the heights, to which they riſe in equal tubes, will be as the increaſe of their bulk. Therefore the heights to which they riſe, or the variations in equal degrees of heat, will be as the capacity of the ball, when the tubes are equal. We have here ſuppoſed that the ſpirits in the balls of the thermometers are equally heated quite through. In ſudden changes of heat and cold, it will be otherwiſe: for the ſpirits in a ſmall ball will be ſooner heated quite through than in a large one. And conſequently, if the heat does not laſt long enough to warm the ſpirits in a large ball as much as they are warmed in a ſmall one, the ſpirits will not be equally rarefied in both, and will not ſwell in proportion to their reſpective bulks; but thoſe in the ſmall ball will ſwell more in proportion than thoſe in the large one. Secondly, If the balls are equal, the variations will be inverſely as the baſes of the ſtems. For if the balls are equal, then, upon being equally heated, the ſpirits contained in them will ſwell equally; and conſequently equal quantities will riſe into the ſtems. Now the ſpirits which riſe into a cylindrical ſtem are a cylindrical column. But the heights of equal cylinders are inverſely as their baſes. Therefore, when the balls are equal, and equal cylinders of ſpirits riſe into the ſtems, the heights to which they riſe, or the variations, will be inverſely as the baſes of the ſtems.

An univerſal ſcale may be made, by which the variations of different thermometers may be compared with one another.

Let the ball of a thermometer be put into water when it is beginning to freeze, or, which is the ſame as to heat or cold, into ſnow when it is beginning to melt; and let the place where the fluid in the thermometer ſtands be marked. The place where the fluid ſtands in ſuch a trial is the freezing point. Let the ball of the ſame thermometer be put into water juſt hot enough to let wax, that ſwims upon it, begin to coagulate. This again is another determinate degree of heat, and is to be marked upon the thermometer. Divide the diſtance between theſe two points into 110 equal parts; and each of theſe parts we call a degree. Now a thermometer often ſinks lower than the freezing point; becauſe the cold is frequently more intenſe than what is juſt ſufficient to make water freeze: for this reaſon, the ſcale muſt not begin from the freezing point. This point, therefore, ſhould not be marked 0, nor ſhould the point where melted wax begins to coagulate be marked 110. In this ſcale, which from the inventor is called Farenheit's ſcale, the freezing point is marked 32; and then the point, where melted wax begins to coagulate, being 110 degrees above it, muſt be marked 142. When the length of a degree is thus found in one part of the ſcale, 32 degrees of the ſame length are ſet off below the freezing point, and as many ſuch degrees as we pleaſe are ſet off above the point where melted wax begins to coagulate. If the thermometer is made with ſpirits of wine, only 33 degrees need be ſet off or marked above 142: and then the ſcale will begin from 0; 32 degrees will be the freezing point; 142 will be the point where melted wax begins to coagulate; and $142+33=175$ degrees will be the higheſt point marked in the ſcale. The reaſon why no higher degree need be marked in a ſcale applied to a thermometer made with ſpirits, is, that at this degree of heat the ſpirits will boil, and conſequently the thermometer would burſt. But if the thermometer is made with mercury, the ſcale ſhould contain at leaſt 212 degrees from the bottom to the top, or 32 degrees below the freezing point, and 180 above it. The heat of boiling water, at the middle height of the mercury in the barometer, or in the middle weight of the atmoſphere, will raiſe the mercury in the thermometer to 212 degrees, or 180 degrees above the freezing point. A thermometer made with mercury will not burſt in ſuch a degree of heat as this; for mercury requires a greater degree to make it boil.

In thermometers with ſuch a ſcale, or, as they are called, in Farenheit's thermometers, the greateſt degree of heat in the external parts of the human body is commonly about 96. Boerhave imagined that air, if its heat exceeded 80 or 90 degrees at moſt, would be deſtructive to the life of animals. But in this he was miſtaken. For in the year 1732 the thermometer in Penſylvania was at the height of 96 or 97; and in the year 1734 the height of it at Peterſburgh was 98 degrees. The thermometer in our own climate is ſcarce ever higher than 78 degrees, and ſeldom lower than 18; ſo that we may reckon 48 degrees to be the middle temperature of our air.

The variations of different thermometers, though they are not equal, may be compared with one another by Farenheit's ſcale. For each degree upon different thermometers is proportional to their reſpective variations; and conſequently, though in equal heats one may vary more than another, yet each will vary an equal number of degrees. Thus, if, upon any given increaſe of heat, one thermometer will vary twice as much as another, then the diſtance between the freezing point and the point where melted wax begins to coagulate will be twice as great, or 110 degrees will be twice as long, in one as in the other. Therefore each degree will be twice as long in the former thermometer as in the latter. But by the ſuppoſition, one of theſe thermometers in a given degree of heat will vary twice as much as the other does; and conſequently, whatever heat raiſes the former one degree, will likewiſe raiſe the latter one degree.

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If the ball of a thermometer is dipped into hot water, the fluid in the thermometer will ſink a little before it begins to riſe.

Not only fluids, ſuch as ſpirits, oil, or mercury, but likewiſe glaſs, or iron, or almoſt any hard bodies, will expand when they are heated, and will contract again when they grow cold. Now, when the ball of a thermometer is dipped into hot water, the heat will be communicated to the glaſs of which the ball is made, before it is communicated to the fluid contained in the ball. By this means the ball will be expanded, and the capacity of it will be increaſed, ſo that ſome of the fluid will ſink out of the ſtem into it. But when the ball has been long enough in the water for the fluid within it to be heated, this fluid will be expanded; and then it will riſe into the ſtem, and will continue to riſe as the heat increaſes.

Of SOUND.

Sound, in the body that produces it, is a trembling motion: this motion is communicated to the air, and the air conveys it to the ear.

When any elaſtic body is ſtruck, ſo as to produce a ſound, the body, or ſome part of it, is made to vibrate. This is evident to ſenſe in the ſtrings of a violin or harpſichord; for either the eye may ſee, or the hand may feel, the trembling of the ſtrings, when by ſtriking them they are made to ſound. See Musick.

If a bell is ſtruck by its clapper on the inſide, the bell is made to vibrate. The baſe of the bell is a circle; but by ſtriking any part of this circle on the inſide, the part which is ſtruck will fly out a little way, ſo that the diameter, which paſſes through this part of the circular baſe, will become longer than another diameter which croſſes this at right angles. Therefore by the ſtroke the baſe will be changed into an ellipſis, whoſe longer axis will paſs through the part againſt which the clapper ſtruck. But the elaſticity of the bell will reſtore the figure of the baſe, and will make the part which was forced out of its place return back. This part in returning will acquire velocity, in the ſame manner as an elaſtic ſtring would in the ſame circumſtances. And ſince it acquires velocity in returning to its place, it will not ſtop at that place, but will over-run it. Thus the circular figure of the baſe will be changed into an ellipſis again; only now the ſhorter axis will paſs through the part that was firſt ſtruck. If the bell was to be ſtruck at firſt by a hammer on the outſide, the part ſtruck would move inwards; and ſuch a motion would likewiſe change the baſe into an ellipſis: only in this caſe the ſhorter axis of the ellipſis would paſs through that part where the blow was given. The elaſticity of the bell will reſtore its figure; and as the part which was ſtruck will acquire velocity in returning to its proper ſituation, the acquired velocity will not ſuffer it to reſt there, but will carry it farther out from the oppoſite ſide; and the baſe will by this means be again changed into an ellipſis, having the longer axis at that part where the blow was firſt given. Thus we have ſeen, that where-ever the bell is ſtruck, the parts of it will perform one vibration; the part, which is ſtruck will yield to the blow; the elaſticity of the bell will bring it back to its former ſituation; in returning, it will acquire velocity; and as far as the blow had driven it one way, ſo far the acquired velocity will carry it the other. But ſince, after one vibration is thus performed, the figure of the baſe will be elliptical; the parts of the bell will vibrate a ſecond time; and ſo on, in the ſame manner that an elaſtic ſtring vibrates.

The ſame ſtroke which makes a bell vibrate makes it ſound too; and as the vibrations decay, the ſound grows weaker. Our ſenſes may convince us that the parts of a bell are in a trembling or vibratory motion whilſt the bell ſounds: for if we lay our hand upon it, we may feel it jar; or if ſmall ſtraws or pieces of paper are thrown upon it, we may ſee that the jarring or trembling of the bell will put them in motion.

But the air muſt convey this vibratory motion to the ear: for otherwiſe, though the ſounding body is made to vibrate, no ſound will be heard. Thus if a bell is rung in the receiver of an air-pump, the ſound will grow weaker as the air is exhauſted; and, when all the air is drawn out of the receiver, no ſound at all will be heard. When the air is admitted again into the receiver, the ſound will at the firſt entrance of the air begin to be heard, and will grow louder as more air returns. If the bell was to be rung in like manner in a veſſel where the air is condenſed, the ſound of it would be much louder than it is in common air. And accordingly, when divers are let down to any great depth of water, becauſe the air in the diving-bell is much condenſed, they ſeem to one another to ſpeak much louder than uſual.

The intenſity of ſound, at different diſtances from the ſounding body, is inverſely as the ſquares of the diſtances.

Sounds may differ from one another, both in reſpect of their tone, and in reſpect of their intenſity or ſtrength. In reſpect of their tone, they are diſtinguiſhed into grave and acute; in reſpect of their intenſity, they are diſtinguiſhed into loud or ſtrong, and low or weak. The tone of any ſound depends upon the time that an impreſſion continues, and is not altered by the diſtance of the ear from the ſounding body. But the intenſity or ſtrength of any ſound depends upon the force with which the particles of air, as they are condenſed, ſtrike the ear; and this force is found to be different at different diſtances, ſo that a ſound which is very loud if we are near the body that produces it, would be weaker if we were farther from it, and our diſtance from it may be ſo great that we cannot hear it at all.

The proportion in which the intenſity of ſound decreaſes, as the diſtance of the ear from the ſounding body increaſes, is this: If the different diſtances at which the ear is placed are to one another as 1, 2, 3, 4, 5; then the ſquares of thoſe diſtances are 1, 4, 9, 16, 25; and the intenſity of ſound will be inverſely as theſe ſquares, or as the reciprocals of theſe ſquares; that is, the ſtrength of the ſound will decreaſe in the ſame proportion with the fractions, $\frac{1}{1}$ $\frac{1}{4}$ $\frac{1}{9}$ $\frac{1}{16}$ $\frac{1}{25}$, which are the reciprocals of 1, 4, 9, 16, 25. This is what we mean when we ſay, that the intenſity of ſound is inverſely as the ſquares of the diſtances, or that it decreaſes in the departure of the ear from the ſounding body in the ſame proportion that the ſquares of the diſtances increaſe.

The intenſity of ſound decreaſes as the vibrations in the ſounding body grow weaker.

If an elaſtic ſtring was to ſtop all at once, the ſound produced by it would ceaſe immediately. But if the vibrations of

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of the ſtring decay gradually, the ſound will likewiſe keep growing weaker, till it becomes too weak to be heard. The ſtring performs all its vibrations from the firſt to the laſt in equal times, and conſequently each pulſe that the ſtring produces is produced in an equal time, and upon that account each pulſe from the firſt to the laſt will have the ſame thickneſs. But when the thickneſs of the pulſe is given, the quantity of air, or number of particles, by which the ear is ſtruck, will likewiſe be given; and the moment with which it is ſtruck, or the intenſity of the ſound, will be as the velocity with which the particles move. Now the velocity of the ſtring is ſucceſſively communicated to the particles of air, as they are made to vibrate. Therefore, as the velocity of the ſtring decays, the velocity of the particles, and conſequently the intenſity of the ſound, will likewiſe decay.

The intenſity of ſound is increaſed by a ſpeaking-trumpet.

When a man ſpeaks without ſuch a trumpet, the pulſes, as they are produced, dilate themſelves in all directions, or the motion is immediately communicated to the air all round him. But if he ſpeaks in a trumpet, his voice, that is, the motion produced by his voice, is confined to the ſmall portion of air contained in the trumpet. For this reaſon, as there are fewer particles to be moved than there are when the motion dilates itſelf immediately in all directions, the motion that is communicated will be greater, and conſequently, when the voice comes out of the trumpet, its intenſity or ſtrength will be greater, than it would have been if it had been propagated in all directions at firſt.

Sound moves with the ſame velocity at all diſtances from the ſounding body.

The ſound of a cannon, or of a bell, moves at the rate of 1142 feet in a ſecond at all diſtances from the gun or the bell. If it moves at this rate for the firſt mile, it would move juſt at the ſame rate for the ſecond mile: ſo that a perſon who is within one mile of the cannon when it is diſcharged, will hear the report juſt as ſoon again as another who is at the diſtance of two miles. The velocity of the ſound does not decreaſe as it is propagated forwards, but continues the ſame from the firſt to the laſt. This property of ſound has been proved by repeated experiments.

When ſound ſtrikes againſt an obſtacle, is will be reflected.

By ſound we here mean the pulſes in the air, which are, properly ſpeaking, the cauſes of ſound. If theſe pulſes in their progreſs ſtrike upon any obſtacle, ſuch as a rock, a thick wood, or the ſide of a building, the air, which is condenſed at the obſtacle, is prevented from expanding itſelf forwards, or from propagating the ſound beyond the obſtacle. Therefore, in expanding itſelf, the motion, which would otherwiſe have been propagated forwards, will be returned from the obſtacle; and a perſon, who is placed ſo as to receive the pulſes in their return, will hear the ſound by reflection. Such a reflected ſound is called an echo.

The number of ſyllables which an echo repeats diſtinctly depends upon the diſtance of the obſtacle from whence the ſound is reflected. The ſyllables that we hear diſtinctly repeated are thoſe which are returned after we have done ſpeaking. Therefore, if the obſtacle is ſo near to us, that the firſt ſyllable we ſpeak will be returned before we can ſpeak a ſecond, no reflected ſound at all can be heard diſtinctly; becauſe the direct and reflected ſound, or the voice and the echo, will be confounded with one another. If the obſtacle is at ſuch a diſtance, that five ſyllables may be ſpoken before one will be returned; then if we ſpeak a ſentence conſiſting of ten ſyllables, the firſt five will be reflected whilſt we are ſpeaking the five laſt, ſo that in ſpeaking the five laſt ſyllables the voice will be confounded with the echo of the five firſt, and we ſhall hear the echo of only the five laſt ſyllables diſtinctly, becauſe theſe only will be returned after we have done ſpeaking. But if the obſtacle is at ſuch a diſtance, that we may ſpeak ten ſyllables before the firſt of them will return to the ſpeaker; then if we ſpeak a ſentence of only ten ſyllables, we ſhall have done ſpeaking before the echo begins, and conſequently we may hear the whole ſentence diſtinctly repeated by the echo.

Sometimes the ſame ſound is frequently repeated by an echo. This happens when there are ſeveral obſtacles at different diſtances. For though there are ſeveral obſtacles, yet if all of them are at the ſame diſtance, the ſound will be returned from them all at one and the ſame time; and conſequently the ſeveral reflected ſounds will be heard togegether, and will make but one echo. But if the obſtacles are at different diſtances, each will return the ſound at a different time, and as many echoes will be heard as there are obſtacles that produce them.

The Diving Bell.

The air in a diving-bell is compreſſed by the weight of the atmoſphere before the bell is let down into the water. But when it has ſunk 35 feet below the ſurface, the air contained in it is compreſſed by the weight of the atmoſphere as before, and by the weight of 35 feet of water beſides, which is equivalent to another atmoſphere. Therefore the compreſſing force at this depth is doubled, and conſequently the air in the bell will then be twice as denſe as the common air that we breathe. As much air, likewiſe, as juſt fills the bell, when it is at the ſurface of the water, will, at the depth of 35 feet, only fill half of it; for as the compreſſing force is doubled, the ſame quantity of air will be reduced to half its uſual dimenſions. For this reaſon, the water would riſe into the bell, through the baſe or bottom of it, which is always open, and would fill the other half of it, if there was not a contrivance for bringing down additional air enough to force out this water, and to keep the whole capacity of the bell full of air. However, the air which fills it will, at the depth of 35 feet, have twice the denſity that common air has; and at the depth of 70 feet, where it will be compreſſed by the weight of another atmoſphere, it will have triple the denſity of common air.

We ſhall here give a ſhort account of the contrivance for bringing down additional air to the diving-bell: becauſe it will ſerve to ſhew, that if a veſſel full of air is ſunk into water, and the water communicates with the air in the veſſel, then the preſſure upon that air will be ſo much the greater as the veſſel is ſunk farther below the ſurface of the water. The contrivance is this. A barrel is made uſe of, which has one bung-hole in the lower part of it, and another in the upper part. A leathern pipe is faſtened to the hole in the upper part; and this pipe is ſo long, that, when it hangs down on the outſide of the barrel, its orifice reaches below the bung hole in the lower part. If this barrel, by the help of weights faſtened to it, is made to ſink with its bottom downwards, the water, by preſſing againſt the lower bung-

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bung hole, will condenſe the air contained in the barrel: for, notwithſtanding this preſſure, none of the air can eſcape through the upper hole, becauſe it is kept in by a greater preſſure againſt the orifice of the leathern pipe which hangs below the bottom of the barrel, and conſequently, being deeper in the water, ſuſtains a greater preſſure than what acts againſt the lower bung-hole. If the barrel is let down in this manner, till it gets below the bell, and then the end of the leathern pipe is lifted up into the bell; the lower bung-hole will then be more preſſed than the orifice of the pipe; and therefore the air contained in the barrel will be driven up through the pipe, and will be received into the bell. And becauſe the barrel is deeper in the water than the bell is, the water will preſs more againſt the baſe of the barrel to force the air out of it than it does againſt the baſe of the bell: for which reaſon the air will ruſh out of the barrel with force enough to drive out any water which had riſen into the bell whilſt it was deſcending.

By the ſame contrivance, freſh air is brought down to the bell as often as there is occaſion for it. The air, which has been heated by frequently breathing it, is let out through a ſtop cock in the top of the bell, and riſes in bubbles to the ſurface of the water, whilſt freſh air is received from the leathern pipe of a barrel contrived in the manner already deſcribed.

Air *neceſſary for the* life *of* animals.

All common air is impregnated with a certain kind of *vivifying ſpirit* or quality, which is neceſſary to continue the lives of animals: and this, in a gallon of air, is ſufficient for one man during the ſpace of a minute, and not much longer.

This ſpirit in air is deſtroyed by paſſing through the lungs of animals; and hence it is, that an animal dies ſoon, after being put under a veſſel which admits no freſh air to come to it. This ſpirit is alſo in the air which is in water; for fiſh die when they are excluded from freſh air, as in a pond that is cloſely frozen over. And the little eggs of inſects ſtopped up in a glaſs, do not produce their young, though aſſiſted by a kindly warmth. The ſeeds alſo of plants mixed with good earth, and incloſed in a glaſs, will not grow.

This enlivening quality in air is alſo deſtroyed by the air's paſſing through fire; particularly charcoal fire, or the flame of ſulphur. Hence ſmoking chimneys muſt be very unwholeſome, eſpecially if the rooms they are in be ſmall and cloſe. See Smoke.

Air is alſo vitiated, by remaining cloſely pent up in any place for a conſiderable time; or perhaps, by being mixed with malignant ſteams and particles flowing from the neighbouring bodies; or laſtly, by the corruption of the vivifying ſpirit; as in the holds of ſhips, in oil-ciſterns, or wine-cellars, which have been ſhut up for a conſiderable time. The air in any of them is ſometimes ſo much vitiated, as to be immediate death to any animal that comes into it.

Air that has loſt its vivifying ſpirit is called *damp*, not only becauſe it is filled with humid or moiſt vapours, but becauſe it deadens fire, extinguiſhes flame, and deſtroys life. The dreadful effects of damps are ſufficiently known to ſuch as work in mines.

The atmoſphere is the common receptacle of all the effluvia or vapours ariſing from different bodies; of the ſteams and ſmoke of things burnt or melted; the fogs or vapours proceeding from damp watery places; and of effluvia from ſulphureous, nitrous, acid, and alkaline bodies. In ſhort, whatever may be called volatile riſes in the air to greater or leſs heights, according to its ſpecific gravity.

When the effluvia which ariſe from acid and alkaline bodies meet each other in the air, there will be a ſtrong conflict or *fermentation* between them; which will ſometimes be ſo great, as to produce a fire; then if the effluvia be combuſtible, the fire will run from one part to another, juſt as the inflammable matter happens to lie.

Any one may be convinced of this, by mixing an acid and an alkaline fluid together, as the ſpirit of nitre and oil of cloves; upon the doing of which, a ſudden ferment, with a fine flame, will ariſe; and if the ingredients be very pure and ſtrong, there will be a ſudden exploſion.

Whoever conſiders the effects of fermentation, cannot be at a loſs to account for the dreadful effects of *thunder* and *lightening*; (ſee Electricity:) For the effluvia of ſulphureous and nitrous bodies, and others that may riſe into the atmoſphere, will ferment with each other, and take fire very often of themſelves; ſometimes by the aſſiſtance of the ſun's heat.

If the inflammable matter be thin and light, it will riſe to the upper part of the atmoſphere, where it will flaſh without doing any harm; but if it be denſe, it will lie nearer the ſurface of the earth, where taking fire, it will explode with a ſurpriſing force; and by its heat rarefy and drive away the air, kill men and cattle, ſplit trees, walls, rocks, *&c.* and be accompanied with terrible claps of thunder.

The heat of lightening appears to be quite different from that of other fires; for it has been known to run through wood, leather, cloth, *&c.* without hurting them, while it has broken and melted iron, ſteel, ſilver, gold, and other hard bodies. Thus it has melted or burnt aſunder a ſword, without hurting the ſcabbard; and money in a man's pocket, without hurting his cloaths: the reaſon of this ſeems to be, that the particles of the fire are ſo fine, as to paſs through ſoft looſe bodies without diſſolving them; whilſt they ſpend their whole force upon the hard ones.

It is remarkable, that knives and forks which have been ſtruck with lightening have a very ſtrong magnetical virtue for ſeveral years after.

Much of the ſame kind with lightening, are thoſe exploſions, called *fulminating* or *fire-damps*, which ſometimes happen in mines; and are occaſioned by ſulphureous and nitrous, or rather oleaginous particles, riſing from the mine, and mixing with the air, where they will take fire by the lights which the workmen are obliged to make uſe of. The fire being kindled will run from one part of the mine to another, like a train of gunpowder, as the combuſtible matter happens to lie. And as the elaſticity of the air is increaſed by heat, that in the mine will conſequently ſwell very much, and ſo, for want of room, will explode with a greater or leſs degree of force, according to the denſity of the combuſtible vapours. It is ſometimes ſo ſtrong as to blow up the mine; and at other times ſo weak, that when it has taken fire at the flame of a candle, it is eaſily blown out.

Air that will take fire at the flame of a candle may be produced thus. Having exhauſted a receiver of the air-pump, let the air run into it through the flame of the oil of turpentine: then remove the cover of the receiver; and holding a candle to that air, it will take fire, and burn quicker or ſlower, according to the denſity of the oleaginous vapour.

When ſuch combuſtible matter, as is above-mentioned, kindles

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kindles in the bowels of the earth, where there is little or no vent, it produces *earthquakes*, and violent ſtorms or hurricanes of wind when it breaks forth into the air.

An artificial earthquake may be made thus. Take 10 or 15 pounds of ſulphur, and as much of the filings of iron, and knead them with common water into the conſiſtence of a paſte: this being buried in the ground, will, in 8 or 10 hours time, burſt out in flames, and cauſe the earth to tremble all around to a conſiderable diſtance.

From this experiment we have a very natural account of the fire of mount Ætna, Veſuvius, and other volcano's, they being probably ſet on fire at firſt by the mixture of ſuch metalline and ſulphureous particles.

Of the Air-pump.

The *air-pump* being in effect the ſame as the water-pump, (ſee Hydrostatics,) whoever underſtands the one will be at no loſs to underſtand the other.

Having put a wet leather on the plate *LL* of the air-pump, (Plate CXLV. fig. 8.) place the glaſs receiver *M* upon the leather, ſo that the hole *i* in the plate may be within the glaſs. Then, turning the handle *F* backward and forward, the air will be pumped out of the receiver; which will then be held down to the plate by the preſſure of the external air or atmoſphere. For, as the handle (fig. 9.) is turned backwards, it raiſes the piſton *de* in the barrel *BK*, by means of the wheel *F* and rack *Dd*; and as the piſton is leathered ſo tight, as to fit the barrel exactly, no air can get between the piſton and barrel; and therefore, all the air above *d* in the barrel is lifted up towords *B*, and a vacuum is made in the barrel from *e* to *b*; upon which, part of the air in the receiver *M* (fig. 8.) by its ſpring, ruſhes through the hole *i*, in the braſs plate *LL*, along the pipe *GGG* (which communicates with both barrels by the hollow trunk *IHK* (fig. 9) and, puſhing up the valve *b*, enters into the vacant place *be* of the barrel *BK*. For, where-ever the reſiſtance or preſſure is taken off, the air will run to that place, if it can find a paſſage.—Then, as the handle *F* will be turned forward, the piſton *de* will be depreſſed in the barrel; and, as the air which had got into the barrel cannot be puſhed back through the valve *b*, it will aſcend through a hole in the piſton, and eſcape through a valve at *d*; and be hindered by that valve from returning into the barrel, when the piſton is again raiſed. At the next raiſing of the piſton, a vacuum is again made in the ſame manner as before, between *b* and *e*; upon which more of the air, which was left in the receiver *M*, gets out thence by its ſpring, and runs into the barrel *BK*, through the valve *B*. The ſame thing is to be underſtood with regard to the other barrel *Al*, and as the handle *F* is turned backwards and forwards, it alternately raiſes and depreſſes the piſtons in their barrels, always raiſing one whilſt it depreſſes the other. And, as there is a vacuum made in each barrel when its piſton is raiſed, every particle of air in the receiver *M* puſhes out another, by its ſpring or elaſticity, through the hole *i* and pipe *GG*, into the barrels, until at laſt the air in the receiver comes to be ſo much dilated, and its ſpring ſo far weakened, that it can no longer get through the valves: and then no more can be taken out. Hence there is no ſuch thing as making a perfect vacuum in the receiver: for the quantity of air taken out at any one ſtroke, will always be as the denſity thereof in the receiver: and therefore it is impoſſible to take it all out, becauſe, ſuppoſing the receiver and barrels of equal capacity, there will be always as much left as was taken out at the laſt turn of the handle.

There is a cock *k* below the pump-plate, which being turned lets the air into the receiver again; and then the receiver becomes looſe, and may be taken off the plate. The barrels are fixed to the frame *Eee* by two ſcrew-nuts *ff*, which preſs down the top piece *E* upon the barrels; and the hollow trunk *H* (in fig. 9.) is covered by a box, as *GH* in fig 8.

There is a glaſs tube *lmmmn* open at both ends, and about 34 inches long; the upper end communicating with the hole in the pump-plate, and the lower end immerſed in quickſilver at *n* in the veſſel *N*. To this tube is fitted a wooden ruler *nm*, called the *gage*, which is divided into inches and parts of an inch, from the bottom at *n* (where it is even with the ſurface of the quickſilver) and continued up to the top, a little below *l*, to 30 or 31 inches.

As the air is pumped out of the receiver *M*, it is likewiſe pumped out of the glaſs tube *lmn*, becauſe that tube opens into the receiver through the pump-plate; and as the tube is gradually emptied of air, the quickſilver in the veſſel *N* is forced up into the tube by the preſſure of the atmoſphere. And if the receiver could be perfectly exhauſted of air, the quickſilver would ſtand as high in the tube as it does at that time in the barometer: for it is ſupported by the ſame power or weight of the atmoſphere in both.

The quantity of air exhauſted out of the receiver on each turn of the handle, is always proportionable to the aſcent of the quickſilver on that turn; and the quantity of air remaining in the receiver, is proportionable to the defect of the height of the quickſilver in the gage, from what it is at that time in the barometer.

EXPERIMENTS with the AIR-PUMP.

I. *To ſhew the reſiſtance of the air.*

1. There is a little machine, conſiſting of two mills, *a* and *b*, (*ibid.* fig. 10.) which are of equal weights, independent of each other, and turn equally free on their axes in the frame. Each mill has four thin arms or ſails fixed into the axis; thoſe of the mill *a* have their planes at right angles to its axis, and thoſe of *b* have their planes parallel to it. Therefore, as the mill *a* turns round in common air, it is but little reſiſted thereby, becauſe its ſails cut the air with their thin edges: but the mill *b* is much reſiſted, becauſe the broad ſides of its ſails move againſt the air when it turns round. In each axle is a pin near the middle of the frame, which goes quite through the axle, and ſtands out a little on each ſide of it; upon theſe pins, the ſlider *d* may be made to bear, and ſo hinder the mills from going when the ſtrong ſpring *c* is ſet on bend againſt the oppoſite ends of the pins.

Having ſet this machine upon the pump-plate *LL* (fig. 8.) draw up the ſlider *d* to the pins on one ſide, and ſet the ſpring *c* at bend upon the oppoſite ends of the pins; then puſh down the ſlider *d*, and the ſpring acting equally ſtrong on each mill, will ſet them both agoing with equal forces and velocities: but the mill *a* will run much longer than the mill *b*, becauſe the air makes much leſs reſiſtance againſt the edges of its ſails than againſt the ſides of the ſails of *b*.

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Draw up the ſlider again, and ſet the ſpring upon the pins as before; then cover the machine with the receiver *M* (fig. 8.) upon the pump plate, and having exhauſted the receiver of air, puſh down the wire *PP* (through the collar of leathers in the neck *q*) upon the ſlider; which will diſengage it from the pins, and allow the mills to turn round by the impulſe of the ſpring; and as there is no air in the receiver to make any ſenſible reſiſtance againſt them, they will both move a conſiderable time longer than they did in the open air; and the moment that one ſtops, the other will do ſo too.—This ſhews that air reſiſts bodies in motion, and that equal bodies meet with different degrees of reſiſtance, according as they preſent greater or leſs ſurfaces to the air, in the planes of their motions.

2 Take off the receiver *M* (fig. 11.) and the mills; and having put the guinea *a* and feather *b* upon the braſs flap *c*, turn up the flap, and ſhut it into the notch *d*. Then, putting a wet leather over the top of the tall receiver *AB* (it being open both at top and bottom) cover it with the plate *C*, from which the guinea and feather tongs *ed* will then hang within the receiver. This done, pump the air out of the receiver; and then draw up the wire *f* a little, which by a ſquare piece on its lower end will open the tongs *ed*; and the flap falling down, as at *c*, the guinea and feather will deſcend with equal velocities in the receiver; and both will fall upon the pump-plate at the ſame inſtant. *N.B.* In this experiment, the obſervers ought not to look at the top, but at the bottom of the receiver; in order to ſee the guinea and feather fall upon the plate; otherwiſe, on account of the quickneſs of their motion, they will eſcape the ſight of the beholders.

II. *To ſhew the weight of the air.*

1. Having fitted a braſs cap, with a valve tied over it, to the mouth of a thin bottle or Florence flaſk, whoſe contents are exactly known, ſcrew the neck of this cap into the hole *i* of the pump-plate; then, having exhauſted the air out of the flaſk, and taken it off from the pump, let it be ſuſpended at one end of a balance, and nicely counterpoiſed by weights in the ſcale at the other end; this done, raiſe up the valve with a pin, and the air will ruſh into the flaſk with an audible noiſe; during which time, the flaſk will deſcend, and pull down that end of the beam. When the noiſe is over, put as many grains into the ſcale at the other end as will reſtore the equilibrium; and they will ſhew exactly the weight of the quantity of air which has got into the flaſk, and filled it. If the flaſk holds an exact quart, it will be found, that 17 grains will reſtore the equipoiſe of the balance, when the quickſilver ſtands at $29\frac{1}{2}$ inches in the barometer; which ſhews, that when the air is at a mean rate of denſity, a quart of it weighs 17 grains; it weighs more when the quickſilver ſtands higher, and leſs when it ſtands lower.

2. Place the ſmall receiver *O* (fig. 8.) over the hole *i* in the pump-plate; and upon exhauſting the air, the receiver will be fixed down to the plate by the preſſure of the air on its outſide, which is left to act alone, without any air in the receiver to act againſt it: and this preſſure will be equal to as many times 15 pounds, as there are ſquare inches in that part of the plate which the receiver covers; which will hold down the receiver ſo faſt, that it cannot be got off, until the air be let into it by turning the cock *k*; and then it becomes looſe.

3. Set the little glaſs *AB* (fig. 12) (which is open at both ends) over the hole *i* upon the pump-plate *LL*, and put your hand cloſe upon the top of it at B: then upon exhauſting the air out of the glaſs, you will find your hand preſſed down with a great weight upon it; ſo that you can hardly releaſe it, until the air be readmitted into the glaſs by turning the cock *k*; which air, by acting as ſtrongly upward againſt the hand as the external air acted in preſſing it downward, will releaſe the hand from its confinement.

4. Having tied a piece of wet bladder *b* (fig. 13.) over the open top of the glaſs *A* (which is alſo open at bottom) ſet it to dry, and then the bladder will be tight like a drum. Then place the open end *A* upon the pump-plate, over the hole *i*, and begin to exhauſt the air out of the glaſs. As the air is exhauſting, its ſpring in the glaſs will be weakened, and give way to the preſſure of the outward air on the bladder, which, as it is preſſed down, will put on a ſpherical concave figure, which will grow deeper and deeper, until the ſtrength of the bladder be overcome by the weight of the air; and then it will break with a report as loud as that of a gun —If a flat piece of glaſs be laid upon the open top of this receiver, and joined to it by a flat ring of wet leather between them; upon pumping the air out of the receiver, the preſſure of the outward air upon the flat glaſs will break it all to pieces.

5. Immerſe the neck *cd* (fig. 14.) of the hollow glaſs ball *eb* in water, contained in the phial *aa*; then ſet it upon the pump-plate, and cover it and the hole *i* with the cloſe receiver *A*; and then begin to pump out the air. As the air goes out of the receiver by its ſpring, it will alſo by the ſame means go out of the hollow ball *eb*, through the neck *dc*, and riſe up in bubbles to the ſurface of the water in the phial; from whence it will make its way, with the reſt of the air in the receiver, through the air-pipe *GG* and valves *a* and *b*, into the open air. When it has done bubbling in the phial, the ball is ſufficiently exhauſted; and then, upon turning the cock *k*, the air will get into the receiver, and preſs ſo upon the ſurface of the water in the phial, as to force the water up into the ball in a jet, through the neck *cd*, and will fill the ball almoſt full of water. The reaſon why the ball is not quite filled, is becauſe all the air could not be taken out of it; and the ſmall quantity that was left in, and had expanded itſelf ſo as to fill the whole ball, is now condenſed into the ſame ſtate as the outward air, and remains in a ſmall bubble at the top of the ball; and ſo keeps the water from filling that part of the ball.

6. Pour ſome quickſilver into the jar D (fig. 15.) and ſet it on the pump plate near the hole *i*; then ſet on the tall open receiver *AB*, ſo as to be over the jar and hole; and cover the receiver with the braſs plate *C*. Screw the open glaſs tube *fg* (which has a braſs top on it at *h*) into the ſyringe *H*; and putting the tube through a hole in the middle of the plate, ſo as to immerſe the lower end of the tube *e* in the quickſilver at *D*, ſcrew the end *b* of the ſyringe into the plate. This done, draw up the piſton in the ſyringe by the ring *I*, which will make a vacuum in the ſyringe below the piſton; and as the upper end of the tube opens into the ſyringe, the air will be dilated in the tube, becauſe part of it, by its ſpring, gets up into the ſyringe; and the ſpring of the undilated air in the receiver acting upon the ſurface of the quickſilver in the jar, will force part of it up into the tube: for the quickſilver will follow the piſton in the ſyringe, in the ſame way, and for the ſame reaſon, that wa-

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ter follows the piſton of a common pump when it is raiſed in the pump-barrel; and this, according to ſome, is done by ſuction. But to refute that erroneous notion, let the air be pumped out of the receiver *AB*, and then all the quickſilver in the tube will fall down by its own weight into the jar; and cannot be again raiſed one hair's breadth in the tube by working the ſyringe which ſhews, that ſuction had no hand in raiſing the quickſilver: and, to prove that it is done by preſſure, let the air into the receiver by the cock *k* (fig. 8.) and its action upon the ſurface of the quickſilver in the jar will raiſe it up into the tube, although the piſton of the ſyringe continues motionleſs. If the tube be about 32 or 33 inches high, the quickſilver will riſe in it very near as high as it ſtands at that time in the barometer. And, if the ſyringe has a ſmall hole, as *m*, near the top of it, and the piſton be drawn up above that hole, the air will ruſh through the hole into the ſyringe and tube, and the quickſilver will immediately fall down into the jar. If this part of the apparatus be air tight, the quickſilver may be pumped up into the tube to the ſame height that it ſtands in the barometer; but it will go no higher, becauſe then the weight of the column in the tube is the ſame as the weight of a column of air of the ſame thickneſs with the quickſilver, and reaching from the earth to the top of the atmoſphere.

7. Having placed the jar *A* (fig. 16.) with ſome quickſilver in it, on the pump-plate, as in the laſt experiment, cover it with the receiver *B*; then puſh the open end of the glaſs-tube *de* through the collar of leathers in the braſs neck *C* (which it fits ſo as to be air-tight) almoſt down to the quickſilver in the jar. Then exhauſt the air out of the receiver, and it will alſo come out of the tube, becauſe the tube is cloſe at top. When the gauge *mm* ſhews that the receiver is well exhauſted, puſh down the tube, ſo as to immerſe its lower end into the quickſilver in the jar. Now, although the tube be exhauſted of air, none of the quickſilver will riſe into it, becauſe there is no air left in the receiver to preſs upon its ſurface in the jar. But let the air into the receiver by the cock *k*, and the quickſilver will immediately riſe in the tube; and ſtand as high in it, as it was pumped up in the laſt experiment.

Both theſe experiments ſhew, that the quickſilver is ſupported in the barometer by the preſſure of the air on its ſurface in the box, in which the open end of the tube is placed: and that the more denſe and heavy the air is, the higher does the quickſilver riſe; and, on the contrary, the thinner and lighter the air is, the more will the quickſilver fall. For, if the handle *F* be turned ever ſo little, it takes ſome air out of the receiver, by raiſing one or other of the piſtons in its barrel; and conſequently, that which remains in the receiver is ſo much the rarer, and has ſo much the leſs ſpring and weight; and thereupon, the quickſilver falls a little in the tube, but upon turning the cock, and re-admitting the air into the receiver, it becomes as weighty as before, and the quickſilver riſes again to the ſame height. —Thus we ſee the reaſon why the quickſilver in the barometer falls before rain or ſnow, and riſes before fair weather; for, in the former caſe, the air is too thin and light to bear up the vapours, and in the latter too denſe and heavy to let them fall.

N. B. In all mercurial experiments with the air-pump, a ſhort pipe muſt be ſcrewed into the hole *i*, ſo as to riſe about an inch above the plate, to prevent the quickſilver from getting into the air-pipe and barrels, in caſe any of it ſhould be accidentally ſpilt over the jar; for if it once gets into the pipes or barrels, it ſpoils them, by looſening the ſolder, and corroding the braſs.

8. Take the tube out of the receiver, and put one end of a bit of dry hazel-branch, about an inch long, tight into the hole, and the other end tight into a hole quite through the bottom of a ſmall wooden cup: then pour ſome quickſilver into the cup, and exhauſt the receiver of air; and the preſſure of the outward air, on the ſurface of the quickſilver, will force it through the pores of the hazel, from whence it will deſcend in a beautiful ſhower into a cup placed under the receiver to catch it.

9. Put a wire through the collar of leathers in the top of the receiver, and fix a bit of dry wood on the end of the wire within the receiver; then exhauſt the air, and puſh the wire down, ſo as to immerſe the wood into a jar of quickſilver on the pump-plate: this done, let in the air; and upon taking the wood out of the jar, and ſplitting it, its pores will be found full of quickſilver, which the force of the air, upon being let into the receiver, drove into the wood.

10. Join the two braſs hemiſpherical cups *A* and *B* (fig. 17.) together, with a wet leather between them, having a hole in the middle of it; then ſcrew the end *D* of the pipe *CD* into the plate of the pump at *i*, and turn the cock *E*, ſo as the pipe may be open all the way into the cavity of the hemiſpheres; then exhauſt the air out of them, and turn the cock a quarter round, which will ſhut the pipe *CD*, and keep out the air. This done, unſcrew the pipe at *D* from the pump, and ſcrew the piece *Fb* upon it at *D*; and let two ſtrong men try to pull the hemiſpheres aſunder by the rings *g* and *b*, which they will find hard to do; for if the diameter of the hemiſpheres be four inches, they will be preſſed together by the external air with a force equal to 188 pounds. And to ſhew that it is the preſſure of the air that keeps them together, hang them by either of the rings upon the hook *P* of the wire in the receiver *M* (fig. 8.) and upon exhauſting the air out of the receiver, they will fall aſunder of themſelves.

11. Place a ſmall receiver *O* (fig 8.) near the hole *i* on the pump-plate, and cover both it and the hole with the receiver *M*; and turn the wire ſo by the top *P*, that its hook may take hold of the little receiver by a ring at its top, allowing that receiver to ſtand with its own weight on the plate. Then, upon working the pump, the air will come out of both receivers: but the large one *M* will be forcibly held down to the pump by the preſſure of the external air; whilſt the ſmall one *O*, having no air to preſs upon it, will continue looſe, and may be drawn up and let down at pleaſure, by the wire *PP*. But, upon letting it quite down to the plate, and admitting the air into the receiver *M*, by the cock *k*, the air will preſs ſo ſtrongly upon the ſmall receiver *O*, as to fix it down to the plate; and at the ſame time, by counterbalancing the outward preſſure on the large receiver *M*, it will become looſe. This experiment evidently ſhews, that the receivers are held down by preſſure, and not by ſuction, for the internal receiver continued looſe whilſt the operator was pumping, and the external one was held down; but the former became faſt immediately, by letting in the air upon it.

12. Screw the end *A* (fig. 18.) of the braſs pipe *ABF* into the hole of the pump-plate, and turn the cock *e* until the pipe be open; then put a wet leather upon the plate *cd*, which

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which is fixed on the pipe, and cover it with the tall receiver *GH*, which is close at top; then exhauſt the air out of the receiver, and turn the cock *e* to keep it out; which done, unſcrew the pipe from the pump, and ſet its end *A* into a baſon of water, and turn the cock *e* to open the pipe; on which, as there is no air in the receiver, the preſſure of the atmoſphere on the water in the baſon will drive the water forcibly through the pipe, and make it play up in a jet to the top of the receiver.

13. Set the ſquare phial *A* (fig 21.) upon the pump-plate; and having covered it with the wire-cage *B*, put a cloſe receiver over it, and exhauſt the air out of the receiver; in doing of which, the air will alſo make its way out of the phial through a ſmall hole in its neck under the valve *b*. When the air is exhauſted, turn the cock below the plate, to re-admit the air into the receiver; and as it cannot get into the phial again, becauſe of the valve, the phial will be broke into ſome thouſands of pieces by the preſſure of the air upon it. Had the phial been of a round form, it would have ſuſtained this preſſure like an arch, without breaking; but as its ſides are flat, it cannot.

To ſhew the elaſticity or ſpring of the air.

14. Tie up a very ſmall quantity of air in a bladder, and put it under a receiver; then exhauſt the air out of the receiver, and the ſmall quantity which is confined in the bladder (having nothing to act againſt it) will expand itſelf ſo by the force of its ſpring, as to fill the bladder as full as it could be blown of common air. But upon letting the air into the receiver again, it will overpower the air in the bladder, and preſs its ſides almoſt cloſe together.

15. If the bladder ſo tied up be put into a wooden box, and have 20 or 30 pounds weight of lead put upon it in the box, and the box be covered with a cloſe receiver; upon exhauſting the air out of the receiver, that air which is confined in the bladder will expand itſelf ſo, as to raiſe up all the lead by the force of its ſpring.

16. Take the glaſs-ball mentioned in the fifth experiment, (fig. 14.) which was left full of water all but a ſmall bubble of air at top; and having ſet it with its neck downward into the empty phial *aa*, and covered it with a cloſe receiver, exhauſt the air out of the receiver, and the ſmall bubble of air in the top of the ball will expand itſelf, ſo as to force all the water out of the ball into the phial.

17. Screw the pipe *AB* (fig. 18.) into the pump-plate, place the tall receiver *GH* upon the plate *cd*, as in the twelfth experiment, and exhauſt the air out of the receiver: then, turn the cock *e*, to keep out the air; unſcrew the pipe from the pump, and ſcrew it into the mouth of the copper veſſel *CC* (fig. 22.) the veſſel having firſt been about half filled with water. Then turn the cock *e* (fig. 18.) and the ſpring of the air which is confined in the upper veſſel will force the water up through the pipe *AB* in a jet into the exhauſted receiver, as ſtrongly as it did by its preſſure on the ſurface of the water in a baſon, in the twelfth experiment.

18. If a fowl, a cat, rat, a mouſe, or bird, be put under a receiver, and the air be exhauſted, the animal will be at firſt oppreſſed as with a great weight, then grow convulſed, and at laſt expire in all the agonies of a moſt bitter and cruel death.

19. If a butterfly be ſuſpended in a receiver, by a fine thread tied to one of its horns, it will fly about in the receiver, as long as the receiver continues full of air; but if the air be exhauſted, though the animal will not die, and will continue to flutter its wings it cannot remove itſelf from the place where it hangs in the middle of the receiver, until the air be let in again, and then the animal will fly about as before.

20. Pour ſome quickſilver into the ſmall bottle *A* (fig. 19.) and ſcrew the braſs collar *c* of the tube *BC* into the braſs neck *b* of the bottle, and the lower end of the tube will be immerſed into the quickſilver, ſo that the air above the quickſilver in the bottle will be confined there, becauſe it cannot get out about the joinings, nor can it be drawn out through the quickſilver into the tube This tube is alſo open at top, and is to be covered with the receiver *G* and large tube *EF*, which tube is fixed by braſs collars to the receiver, and is cloſe at the top This preparation being made, exhauſt the air both out of the receiver and its tube; and the air will by the ſame means be exhauſted out of the inner tube *BC*, through its open top at *C*; and as the receiver and tubes are exhauſting, the air that is confined in the glaſs bottle *A* will preſs ſo by its ſpring upon the ſurface of the quickſilver, as to force it up in the inner tube as high as it was raiſed in the ninth experiment by the preſſure of the atmoſphere; which demonſtrates that the ſpring of the air is equivalent to its weight.

21 Screw the end *C* (fig. 20.) of the pipe *CD* into the hole of the pump-plate, and turn all the three cocks *d*, *G*, and *H*, ſo as to open the communications between all the three pipes *E*, *F*, *DC*, and the hollow trunk *AB*. Then, cover the plates *g* and *b* with wet leathers, which have holes in their middle where the pipes open into the plates; and place the cloſe receiver *I* upon the plate *g*: this done, ſhut the pipe *F* by turning the cock *H*, and exhauſt the air out of the receiver *I*. Then turn the cock *d*, to ſhut out the air; unſcrew the machine from the pump; and having ſcrewed it to the wooden foot *L*, put the receiver *K* upon the plate *b*: this receiver will continue looſe on the plate as long as it keeps full of air; which it will do until the cock *H* be turned to open the communication between the pipes *F* and *E*, through the trunk *AB*; and then the air in the receiver *K*, having nothing to act againſt its ſpring, will run from *K* into *I*, until it be ſo divided between theſe receivers, as to be of equal denſity in both; and they will be held down with equal forces to their plates by the preſſure of the atmoſphere, though each receiver will then be kept down but with one half of preſſure upon it that the receiver *I* had when it was exhauſted of air; becauſe it has now one half of the common air in it which filled the receiver *K* when it was ſet upon the plate; and therefore a force equal to half the force of the ſpring of common air will act within the receivers againſt the whole preſſure of the common air upon their outſides This is called transferring the air out of one veſſel into another.

22. Put a cork into the ſqaare phial *A*, (fig. 21.) and fix it in with wax or cement; put the phial upon the pump-plate with the wire-cage *B* over it, and cover the cage with a cloſe receiver. Then, exhauſt the air out of the receiver; and the air that was corked up in the phial will break the phial outwards by the force of its ſpring, becauſe there is no air left on the outſide of the phial to act againſt the air within it.

22. Put a ſhrivelled apple under a cloſe receiver, and exhauſt the air; then the ſpring of the air withing the apple will plump it out, ſo as to cauſe all the wrinkles diſappear; but

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Plate CXLV.

Fig. 1. Pheons

Fig. 2. Points

A B C
D
E
F
G H I

Fig. 3. Pobtate

Fig. 6.

Pomee

Fig. 4. Potance

Fig. 5. Potent

Pointee

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 20.

Fig. 14.

Fig. 10.

Fig. 22.

Fig. 21.

Fig. 13.

Fig. 12.

Fig. 15.

Fig. 18.

Fig. 19.

Fig. 16.

Fig. 17.

Fig. 11.

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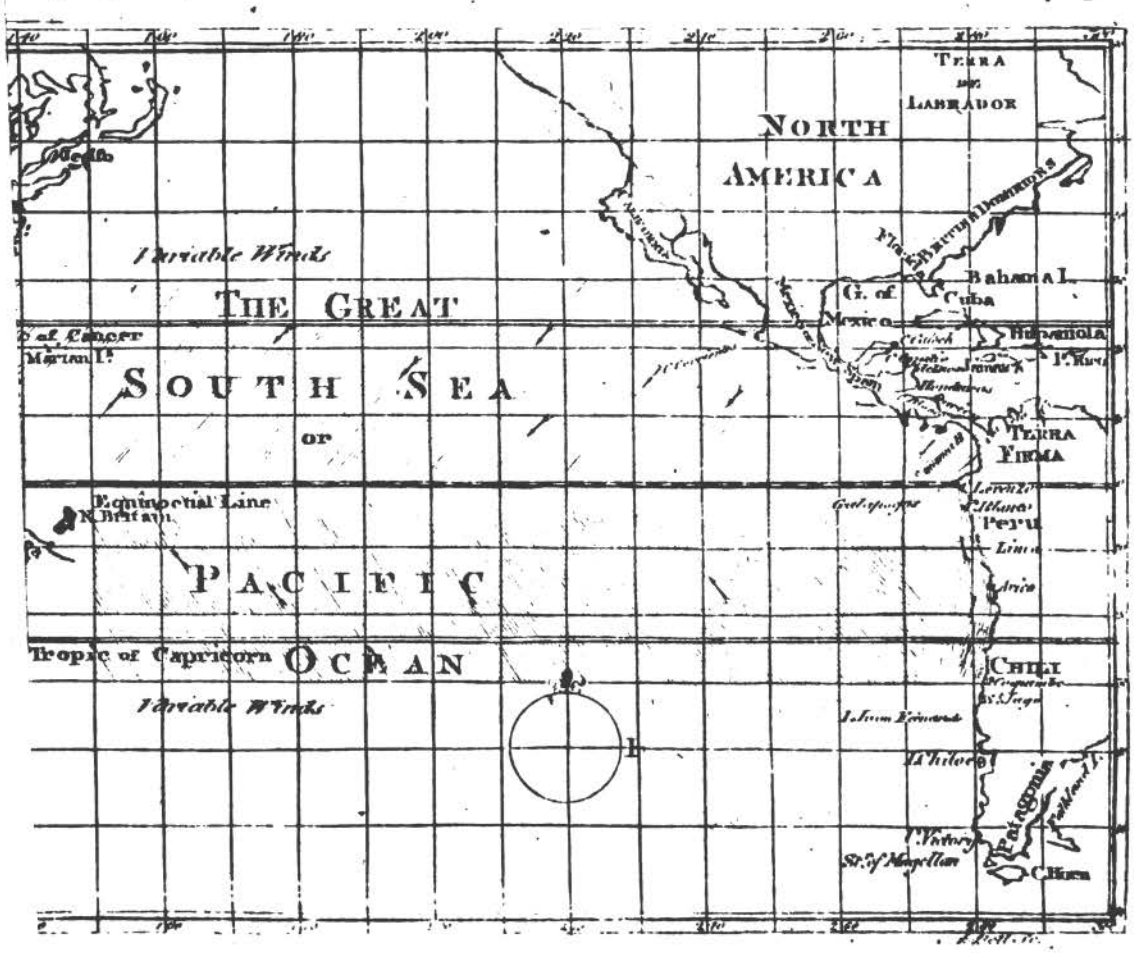
T,

G TRADE-WINDS, through the whole WORLD.

s where the lines are thicker than usual, denote the monsoons,
ten by the darts.



ertained. We have therefore discontinued the lines which denote the course
ine, as in the Atlantic Ocean: upon what authority, we know not It seems
mmer season, and the north wind to the south of it in winter. But obser-

, near the line; or to say exactly, how far the moonsoons, which take place

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but upon letting the air into the receiver again, to preſs upon the apple, it will inſtantly return to its former decayed and ſhrivelled ſtate.

23. Take a freſh egg, and cut off a little of the ſhell and film from its ſmalleſt end; then put the egg under a receiver, and pump out the air; upon which, all the contents in the egg will be forced out into the receiver, by the expanſion of a ſmall bubble of air contained in the great end, between the ſhell and film.

24. Put ſome warm beer in a glaſs; and having ſet it on the pump, cover it with a cloſe receiver, and then exhauſt the air. Whilſt this is doing, and thereby the preſſure more and more taken off from the beer in the glaſs, the air therein will expand itſelf, and riſe up in innumerable bubbles to the ſurface of the beer; and from thence it will be taken away with the other air in the receiver. When the receiver is near exhauſted, the air in the beer, which could not diſentangle itſelf quick enough to get off with the reſt, will now expand itſelf ſo, as to cauſe the beer to have all the appearance of boiling; and the greateſt part of it will go over the glaſs.

25. Put ſome warm water in a glaſs, and put a bit of dry wainſcot or other wood into the water. Then, cover the glaſs with a cloſe receiver, and exhauſt the air; upon which, the air in the wood having liberty to expand itſelf, will come out plentifully, and make all the water to bubble about the wood, eſpecially about the ends, becauſe the pores lie lengthwiſe. A cubic inch of dry wainſcot has ſo much air in it, that it will continue bubbling for near half an hour together.

Of WINDS.

AS the air is a fluid, ſubjected to the ſame laws of gravitation as other fluids, it neceſſarily has a conſtant tendency to preſerve an equilibrium in every part; ſo that, if by any means whatever it is rendered lighter in any one place than another, the weightier air will ruſh in from every ſide towards this place, till as much be there accumulated as makes it of an equal weight with the reſt of the atmoſphere: It is theſe currents of air which are called *winds*.

Many are the cauſes which may vary the weight of the atmoſphere, and occaſion particular topical winds.

Although other cauſes may occaſion winds in certain circumſtances, yet their principal and moſt univerſal cauſe is the ſun, which warmeth the air to a much greater degree in ſome places of the atmoſphere than in others; and as the air is ſuſceptible of a great degree of expanſion by heat in thoſe places where it is heated to any conſiderable degree, it is expanded ſo much as to become lighter than the air in thoſe places where it is colder; ſo that the weightier cold air from all the circumjacent parts ruſhes towards this point to reſtore the equilibrium which had been deſtroyed. So that if there be any particular part upon the earth's ſurface where the ſun acts conſtantly with greater force than on any other part, a current of air will conſtantly flow from theſe towards the warmer region: but the ſun acts with greater force upon thoſe parts of the earth which are neareſt the *Equator*, than thoſe which approach towards either *Pole*; ſo that we might naturally expect that a wind would conſtantly blow from the polar regions towards the Equator; which is really found to be the caſe in the *Torrid Zone*, where the influence of the ſun overcomes almoſt all the other leſſer cauſes which produce the variable winds in our more northerly regions. However, even in the Torrid Zone, theſe north and ſouth winds are varied in different ways.

Although the heat of the equatorial region is greater than any other; yet as the ſun acts perpendicularly in his diurnal courſe upon one point of the equator only at one time, and immediately paſſes over it; and as the air retains the heat communicated to it by the ſun but for a ſhort time, cooling gradually as he retires, and continuing ſtill to decreaſe till his influence again returns the following day; the degree of heat upon this great circle muſt be very different in different parts, and perpetually varying in every point; which muſt in ſome meaſure tend to diſturb thoſe winds coming from the polar regions, which we have already mentioned. To comprehend clearly what will be the effects of this rotation, let us conſider what effect it would naturally produce upon the equator with regard to wind, ſuppoſing no other cauſe ſhould interrupt it. And here we muſt obſerve, that as the point upon which the ſun acts with the greateſt power is conſtantly moving from eaſt to weſt, the air to the eaſt of that point over which the ſun has more lately paſſed will be more rarefied than that to the weſt, and will naturally flow towards that point from eaſt to weſt with greater velocity than from weſt to eaſt, as the cool air to the weſt of that point will be interrupted in its motion towards it by the motion of the ſun meeting it. Hence therefore it follows, that from the diurnal motion of the earth from weſt to eaſt a conſtant eaſt wind would always be produced, were it not obſtructed by other cauſes. But as there is a conſtant ſtream of air flowing from the polar towards the equatorial regions, a compoſition of theſe two currents of air acting at the ſame time will produce a north-eaſt wind in all parts of the northern hemiſphere, and a ſouth-eaſt wind in all parts of the ſouthern one. Theſe winds are known by the name of *the general trade-winds*.

If there were no inequalities on the ſurface of our globe, and if it were compoſed of a ſubſtance perfectly homogeneous, this wind would invariably take place at all times on every part of the earth's ſurface; but as this is not the caſe, it is liable to ſeveral very conſiderable variations. In all thoſe regions towards the poles, as the influence of the ſun is there but weak, other leſſer cauſes occaſion particular winds, and diſturb that regularity which at firſt view we might expect, ſo that the *general trade wind* does not invariably take place beyond the 28th or 30th degree of latitude; and the regions between that and the poles have nothing but variable winds. Even in the Torrid Zone, there are many cauſes which in particular places alter this direction of the wind; ſo that the *genuine trade-winds* do not take place except in the Atlantic and Pacific oceans on each ſide the equator to the diſtance of 28 or 30 degrees, and in the greateſt part of the Indian ocean to the ſouth of the Equator as appears, more diſtinctly upon the MAP; ſee Plate CXLVI. where the courſe of the winds are marked by the direction of the *ſtrokes*, the *darts* pointing in the ſame direction as the wind blows.

Having thus explained the nature and cauſes of the general trade wind, we now proceed to take notice of the principal deviations which take place in the Torrid Zone. The general trade-wind, when thus altered at particular ſeaſons, is known by the name of *monſoons*. There are other variations, which, although as general, are yet of ſmaller and more limited influence. Theſe are known by the name of *breezes*; and as they blow periodically from the ſea, they are denominated *ſea* or *land breezes*, and take place more

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or leſs in every ſea coaſt within the tropics. As the cauſes of the monſoons will be more clearly comprehended after the nature of theſe breezes is explained, we ſhall firſt conſider them.

The ſea and land breezes of the Torrid Zone are gentle periodical winds regularly ſhifting twice every day, and blowing from the ſea towards the land during the day time, and from the land towards the ſea in the night. Theſe breezes do not blow with an equal degree of force throughout the whole day and night, but are perpetually varying, being always ſtrongeſt about mid-day and midnight, and becoming gradually weaker till the time of change in the evening and morning; about which time the air continues for a ſhort ſpace perfectly calm: but in a little the breeze begins to be felt on the ſide oppoſite to that from which it blew laſt, ſo faint at firſt as hardly to be perceived; but by degrees acquiring greater ſtrength, it goes on increaſing for five or ſix hours, after which it again as gradually ſinks and dies away. They always blow directly off or towards the ſhore, and never extend their influence to a great diſtance from it, although this is varied by particular circumſtances in different places; as they never extend ſo far from the points of capes and promontories, as in deep bays; nor upon the windward, as lee-ſhores.

Theſe breezes are produced by the ſame cauſe which gives riſe to the trade-wind, *viz.* the heat of the ſun. In theſe warm regions the days and nights are nearly of an equal length throughout the whole year; the ſun riſing high in the day time, and deſcending almoſt perpendicularly at night; which occaſions a much greater variation between the heat of the day and night than is experienced in the more temperate climates; and it is this great difference between the heat of the night and day which produces the *breezes*. For the rays of the ſun are reverberated from the land during the day-time, much more powerfully than from the ſea, whoſe ſurface is conſtantly evaporating; and the air above the land is rendered much warmer, and conſequently more rarified, than above the ſea; ſo that a current of air neceſſarily takes place at that time from the ſea towards the land, increaſing and diminiſhing in ſtrength as the heat increaſes or declines. But when the ſun deſcends below the horizon, the evaporation from the ſurface of the ſea is ſtopt, or greatly diminiſhed, and the cold which it occaſioned is of conſequence removed: the reverberation of the ſun's rays from the ſurface of the earth is likewiſe removed, and the air above the land quickly reſumes its natural degree of cold, which is always greater than the ſea, when the influence of the ſun is withdrawn; ſo that the air above the ſea becomes warmer during the night than that above the land, and a current of air is of courſe eſtabliſhed from the land to the ſea, which forms the land-breeze, which acts as uniformly, although leſs powerfully, than the ſea-breeze; blowing at firſt gently as the air begins to cool, and gradually gathering ſtrength as the ſun retires below the horizon; till his influence begins to be full again in the morning, when it gradually gives place to the more powerful influences of the ſea-breeze. Theſe breezes are not, however, entirely confined to the Torrid Zone. They are even felt in more northern regions: the ſea-breeze in particular being almoſt as perceptible during the ſummer ſeaſon along the coaſts of the Mediterranean and the Levant, both on the African, and European and Aſiatic ſhores, as within the tropics. Even in our own colder climate, the effects of this are often ſenſibly felt during the ſummer ſeaſon; although, from the length of the day and ſhortneſs of the night, the difference between the heat of theſe is far leſs than in warmer climates. And although the ſhortneſs of our nights prevents us from feeling a nocturnal breeze, ſimilar to the land-breezes of the Torrid Zone; yet in every ſerene evening we have an opportunity of obſerving a phenomenon, proceeding from a ſimilar cauſe with that which occaſions them in warmer climates. For as the waters retain their heat longer than the earth after the ſun withdraws, the moiſture which was raiſed during the heat of the day to a ſmall diſtance from the earth's ſurface is quickly condenſed by the cold of the evening, and falls down in copious dews; whereas that which is above the ſurface of the water is more ſlowly condenſed, by reaſon of the heat which that element retains longer, and hovers at a ſmall diſtance above it in the form of a denſe vapour, which ſlowly ſubſides as it loſes its heat. This is the cauſe of thoſe low miſts which are ſo often ſeen hovering above the ſurface of rivers and other waters in the evenings towards the end of ſummer.

It was already obſerved, that in the Indian ocean the general trade-wind only took place in ſome parts to the ſouth of the Equator. To the north of the line, and in ſome places to the ſouth of it in that ocean, the general trade-wind only blows regularly for ſix months, and during the other ſix months the wind blows in a direction entirely oppoſite. It is theſe winds, which ſhift thus regularly, which are called *Monſoons*, although they are alſo ſometimes called trade-winds.

At the Equator the days and nights are always of an equal length throughout the whole year; ſo that the heat being thus equally divided, it never arives to ſuch an intenſe degree as to be inſupportable to the inhabitants. And as there is no viciſſitude of ſeaſons at the Equator, ſo at the Poles they never experience the more pleaſing viciſſitudes of day and night, the ſun never ſetting during the ſummer ſeaſon, nor riſing above the horizon during the winter: and although the day decreaſes in length as we recede from the pole, from ſix months to twenty-four hours; yet in all high latitudes the ſun deſcends for ſuch a ſhort ſpace below the horizon, and in ſuch an oblique direction, that the difference between the heat of the day and night is but very inconſiderable. From which it follows, that during this ſeaſon, when the ſun continues to act with ſuch uninterrupted influence upon the ſurface of the earth, the air will then be rarified more above the dry land than upon the ſurface of the water; ſo that a wind would naturally ſet in at that time from the ſea towards the land, ſimilar to the diurnal ſea-breezes in the warmer climates; and on the contrary, during the winter ſeaſon, the air in theſe northern regions being colder above the land than the water, the winds will naturally blow from the land towards the ſea, ſimilar to the land-breezes of the Torrid Zone. But as the influence of the ſun, although of longer continuance, is in general more languid in climates of a high latitude than in thoſe near the *line*, it is not to be expected that theſe effects will follow with the ſame regularity as in the Torrid Zone; being more apt to be interrupted by leſſer cauſes which affect the atmoſphere and produce winds in different directions. Yet theſe are not ſo totally interrupted, but that we can eaſily trace their effects even in our own cold climate: For during the ſummer ſeaſon, the large continent to the eaſt of us, being more heated than the Atlantic ocean weſtward, pro-

duces

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duces a general tendency of the current of air towards the *eaſt*, inſomuch that *weſterly* winds are obſerved to prevail more than any other, not only here, but in all the frontier countries on the continent, during the *ſummer* ſeaſon. And *eaſterly* winds become again more prevalent in the *winter* and *ſpring*. On the contrary, it is obſerved in *North America*, that the *eaſterly* winds prevail more in *ſummer* than at any other time; and the *weſt* winds always prevail during the cold months of *winter*. The ſame effects take place with a greater degree of conſtancy in other parts of Europe, particularly in *Greece*, and the countries in that neighbourhood; as the ancient Greeks have particularly remarked, that the winds blew from the *ſouth* during the *heat of ſummer*, particularly about the *dog-days*, and from the north during the colder weather of *winter*.

Any attentive reader, who has accompanied us thus far, will readily ſee, that the *monſoons* which take place in the *Indian ocean* proceed from the ſame general cauſe. For when the ſun, in his annual courſe, has croſſed the *line*, and comes to act very ſtrongly upon the extenſive countries of *Arabia*, *Perſia*, *China*, and the other parts of *India*, theſe become heated to a much higher degree than the ocean to the ſouth of them; and the air above theſe extenſive countries being ſo much rarefied, naturally draws the wind towards that place which, by overcoming the general trade-wind, produces the *ſoutherly monſoons* which take place in all thoſe ſeas during the months of *April*, *May*, *June*, *July*, *Auguſt*, and *September*. But when the ſun has again retreated towards the ſouthern hemiſphere, this great degree of heat in theſe countries ſubſides, and the genuine trade-wind again reſumes its natural courſe; forming what they call the *northerly monſoon*, which blows in the months of *October*, *November*, *December*, *January*, *February*, and *March*: and as the continent of Aſia now aſſumes a greater degree of cold than the Atlantic or Pacific oceans in the ſame latitude, it produces a briſker and more ſteady gale during the continuance of this monſoon, than is ever experienced in the general trade wind.

Having thus explained the nature of the *monſoons* in general, we ſhall proceed to conſider the particulars which influence the direction of theſe in thoſe parts where they take place. In all that part of the Indian ocean which lies between the iſland of *Madagaſcar* and *Cape Commorin*, the wind blows conſtantly from the W. S. W. between the months of *April* and *October*; and in the oppoſite direction from the month of *October* till *April*, although with ſome variation in different places, as theſe winds are neither ſo ſtrong nor conſtant in the *Bay of Bengal* as in the Indian ocean. And it is likewiſe remarkable, that the S. W. winds in theſe ſeas are generally more *ſoutherly* on the *African* ſide, and more *weſterly* on the *Indian*, as appears diſtinctly in the map. But theſe variations are not repugnant to the general theory. For it is ſufficiently known, that high lands in every part of the globe are much colder than low and flat countries; and as that part of *Africa* is very high and mountainous, the cold in theſe regions is much greater than in the more flat countries of *Arabia* and *India*; ſo that the wind naturally blows from theſe cold regions, in the ſummer ſeaſon, towards the warmer continent of *Aſia*; which occaſions thoſe inflections of the wind to the eaſtward which take place in theſe ſeas during the ſummer months; and is ſtill farther aſſiſted by the peninſula of *India*, the kingdom of *Siam*, and the iſlands of *Sumatra* and *Java*, on the eaſtern part of this ocean, lying ſo much farther ſouth than the kingdoms of *Arabia* and *Perſia*; ſo that theſe, being more heated than the ocean to the *weſtward*, naturally draw the wind towards them, and produce the *eaſterly* variation of the monſoon which takes place in this part of the ocean, while the warm and ſandy deſarts of *Arabia* draw the winds more directly *northward* near the *African* coaſt.

In the eaſtern parts of the *Indian ocean*, beyond the iſland of *Sumatra*, through the gulf of *Siam* and bay of *Tonquin*, and along the ſouthern parts of *China*, and among the *Philippine iſlands*, &c. to the north of the Equator, the monſoons obſerve a different direction, blowing nearly due *ſouth* and *north*. Here the greateſt part of the warm continent is to the weſt of this diſtrict, which makes the wind naturally aſſume this direction. A little to the eaſt of this, among the *Mariamne iſlands*, the general trade-wind takes place, there being no continent to the north of them to occaſion monſoons.

The monſoons are as regular in the eaſtern part of the *Indian ocean* to the *ſouth* of the Equator, as they are to the *north* of it; as here a *northern* monſoon ſets in from the month of *October* till *April*, and a *ſouthern* from *April* till *October*. And here, as to the north of the *line*, we find the direction of the monſoons varying according to particular circumſtances in different places: for about the iſland of *Sumatra*, and towards the weſt end of *Java*, the monſoons ſet in nearly from the *north* and *ſouth*; but toward *Celebes* and *Timur*, they begin to tend a little more to the *eaſt* and *weſt*, gradually declining as they approach the coaſt of *New Guinea*, near to which the *northerly monſoon* from *October* till *April* blows from the N. W. and the oppoſite monſoon from the S. E. between *October* and *April*. The reader will eaſily perceive that theſe monſoons are occaſioned by the continent of *New Holland* and *Guinea*, which being heated by the ſun when in the ſouthern ſigns, draws the wind towards that in the ſummer ſeaſon, in the ſame manner as the continent of *Aſia* produces the monſoons to the north of the line. And it is likewiſe ſufficiently plain, that the inflection of theſe periodical winds about *Celebes* and *Timur* is occaſioned by that part of the continent called *New Guinea* jutting out ſo near to the Equator to the eaſt of theſe, and drawing the wind toward that quarter.

Theſe are the moſt general and extenſive monſoons which take place in our globe. But there are other periodical winds, which occur in particular places in theſe warm regions, that deſerve particular attention.

In the *Red-Sea*, the monſoon ſhifts as regularly as in other places; but being influenced by the coaſts, it tends a little more to the north and ſouth than in the Indian ocean.

On the ſouth coaſt of *Africa*, to the ſouth of *C. Corientes*, and about the ſouthern parts of the iſland of *Madagaſcar*, the regular trade-wind from the S. E. takes place between *October* and *April*; but from *April* till *October* the wind blows from the W. or N. W, and is at that ſeaſon exceedingly cold. This is evidently occaſioned by a cauſe already taken notice of: for, notwithſtanding the high and cold nature of this continent, yet when the ſun is to the ſouth of the *line*, his powerful influence at that ſeaſon ſo far abates their natural degree of cold, as not to interrupt the general trade-wind between the months of *October* and *April*: But when he returns to the northern hemiſphere, the high mountains of *Africa* reſume their native coldneſs, and repel the general trade-winds by their cold and more powerful

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ful blaſt, ſo as to produce the intemperate monſoon which here takes place between the months of *April* and *October*.

From *Mozambique*, to cape *Guardafoy*, at the mouth of the *Red Sea*, the monſoons are a little more irregular than in the other parts of the *Indian ocean*. For it is obſerved, that between *October* and *January* the winds are variable, although chiefly from the *north*. In *January* the N. E. monſoon ſets in, and continues regular till the month of *May*. From *May* till *October* the winds again become variable, but blow chiefly from the *ſouthern* points; but in the months of *June*, *July*, and *Auguſt*, there are frequent calms, eſpecially about the bay of *Melinda*, which ſometimes continue for ſeveral weeks together, and extend only about a hundred leagues from ſhore.

Before we can explain the cauſe of this irregularity clearly, it will be neceſſary to attend to the direction of the wind on each ſide of this track at each particular ſeaſon. In the months of *October*, *November*, and *December*, the winds are here variable, but chiefly from the north. Now during theſe three months, the wind to the ſouth of this beyond *C. Corientes* blows from the S. E. at the *Red Sea*, and all to the north of this the wind during this ſeaſon of the year is from the N. E. And as the ſun is then perpendicular to the bay of *Melinda*, theſe oppoſite winds here meeting and oppoſing one another, and being both of them ſtopt in their courſe weſtward by the cold regions of *Africa* near the Mountains of the Moon, will naturally produce the variable winds here obſerved according as the one or the other of theſe three balancing powers ſhall predominate: although, as the coaſt here runs away towards the *ſouth-weſt*, it is natural to expect that the northerly wind, which follows the ſame direction, ſhould more frequently prevail than thoſe which are oppoſed by it; eſpecially when we conſider, that the iſland of Madagaſcar, now beginning to be warmed by the influence of the ſun, will concur in drawing the wind to the ſouthward; and when the continent of *Africa* is more heated in the months of *January* and *February*, it does not oppoſe the eaſterly monſoon, ſo that the winds become then more fixed than before. But in the months of *June*, *July*, and *Auguſt*, the wind to the ſouth of *C. Corientes* is from the N. W.; and near the *Red Sea*, and throughout the northern part of the *Indian ocean*, the S. W. monſoon is then in its greateſt vigour; ſo that on each end of this diſtrict the wind is blowing in an oppoſite direction; from which reſults theſe calms about *Melinda*, which we juſt now mentioned.

This much may ſuffice for the ſhifting winds on the *African* and *Aſiatic* coaſts. As to *America*, the only places where the wind ſhifts regularly are, the bays of *Honduras* and *Campeachy* on the *eaſt*, and that of *Panama* and ſome parts on the coaſt of *Mexico* on the *weſt*, with a ſmall track upon the coaſt of Brazil. In the ſouth part of the bay of *Honduras*, between *C. Gratia de Dios* and *C. la Bela*, the common trade-wind between E and NE blows between *March* and *November*; from *October* till *March*, there are weſterly winds; not conſtant or violent, but blowing moderately ſometimes two or three days, or a week; and then the eaſterly breeze may again prevail for an equal length of time. The reaſon of the peculiarity here obſerved is this. During the ſummer ſeaſon, the high land on the *Iſthmus of Darien* is ſo much warmed as not to interrupt the courſe of the general trade-winds. But when he retires to the ſouthern hemiſphere, the cold upon the *Iſthmus* at that ſeaſon becomes ſo great, as to condenſe the air to ſuch a degree as to repell the trade-wind for ſome time: but not being cooled to ſuch an intenſe degree as in ſome of the larger continents, the trade-wind at times overcomes and repells theſe land breezes in its turn, and produces the phenomena above deſcribed. And that this is really the caſe, appears evident from this circumſtance, that the *land-breezes* are moſt prevalent and of longeſt duration in the coldeſt months of *December* and *January*; before and after which two months, the trade-wind being generally checked, only a day or two about the full or change of the moon. As theſe weſtern breezes on this coaſt take their riſe from the ſame cauſe as the diurnal land breeze in warm climates, they may be conſidered as *land-breezes* of two or three days continuance, and forming an intermediate ſtep between the *land-breezes* and *monſoons*. Although the influence of theſe *breezes* is felt farther off at ſea than the common *diurnal breeze*, yet they do not extend a great way, being ſeldom felt above twenty or thirty or forty leagues from ſhore; and about *C. La Vela*, which is much expoſed to the eaſt wind, theſe breezes ſeldom extend above eight or ten leagues from ſhore. Land breezes of the ſame nature, and proceeding from ſimilar cauſes, are alſo experienced in the winter ſeaſon in the *bay of Campeachy* which are there known by the name of *Sammaſenta* winds. Beyond *C. la Vela* theſe weſtern breezes are not felt, which is undoubtedly occaſioned by the whole of that coaſt as far as *C. St Auguſtine* being ſo much expoſed to the general trade-wind, which here ſweeps along the coaſt with ſo much violence as almoſt totally to repreſs the weaker influence of the *breezes*. But between *C. St Auguſtine* and *St Catharine's iſland*, or a little farther, we again meet with a variation of the wind at different ſeaſons, as it is here obſerved to blow in an E or NE direction from *September* till *April*; and from *April* till *September* from the SW. This variable wind, or monſoon, like the others on this coaſt, extends but for a very ſhort way from ſhore, and is evidently occaſioned by the ſame cauſes as the other periodical winds. For, in the ſummer-months, (which in this climate is between *September* and *April*, the land of the continent being heated by the ſun, draws the trade-wind from its common courſe of SE, a little to the weſtward; and as the coaſt here tends towards the SW, the wind in ſome meaſure (as it always does) follows the ſame direction, and produces this ENE *monſoon*. But, in the winter, when this region becomes more cool, the eaſt wind is repelled by the denſe cold air from the mountains; by which means it is bent to the northward, and is forced along the coaſt to *C. St Auguſtin*; where meeting with no further hindrance, it again falls in with the general trade-wind, and is carried along with it in its proper direction.

We have purpoſely omitted mentioning the winds on the weſt coaſts of *Africa* and *America*, till the others were explained, as the cauſes of the peculiarities there obſerved will be now more eaſily comprehended. On the coaſts of *Chili* and *Peru*, in *America*, from 25° or 30° of ſouth latitude to the line; and on the parallel coaſt of *Angola*, &c. in *Africa*, the wind blows all the year from the ſouth, varying in its direction a little in different places according to the direction of the coaſt, towards which it always inclines a little. But whatever is the direction at any one place, it continues the ſame throughout the whole year without any

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any variation, and always blows from ſome ſouthern point. But there is this difference between this wind upon the coaſts of *Chili* and *Angola*, that it extends much farther out to ſea upon the former than upon the latter.

In order to explain the cauſe of this ſingular phenomenon, it is neceſſary to recollect, that the general trade-wind is produced by the concurrence of two ſeparate cauſes. One is the great heat of the equatorial region, by which alone would be produced a conſtant north or ſouth wind. The other is the diurnal revolution of the earth, which would cauſe a perpetual tendency of the air in theſe warm regions from eaſt to weſt. From the concurrence of theſe two cauſes reſult the general trade-wind, which would conſtantly blow from the SE or NE, as we have already demonſtrated. But if any one of theſe two cauſes, in any particular place, is prevented from producing its full effect, while the other continues to exert its influence, the general direction of the wind will be varied, and it will aſſume another. Thus, if the *eaſt* wind was prevented from acting in any particular place, while nothing interrupted the *ſouth* or *north wind*, it is evident that the air would ruſh towards the equator in that direction which was neareſt and eaſieſt, whether that ſhould be pointing eaſtward or weſtward. Now as the high mountains in the internal parts of *Africa* and *America* interrupt the courſe of the eaſt wind near the ſurface of the earth, while theſe coaſts of which we now treat are entirely open to the ſouth, the wind naturally ruſhes along the coaſts of *Chili* and *Angola* from north to ſouth; and as the low lands near the ſhore, in theſe warm regions, is generally warmer than the ſea, the wind will naturally point in towards the ſhore, as is generally obſerved to happen.

This, then, is the obvious cauſe of the ſouth wind which always prevails upon the coaſts of *Chili* and *Peru*, as well as along the ſhores of *Angola*, *Loango*, &c. But it is only near the ſhore that this can take place; nor can it extend to a great height above theſe low and fertile regions. For as the internal parts of theſe countries are exceedingly high; but more eſpecially the *Andes* of *America*, which experience a perpetual degree of cold more intenſe than ſome polar regions ever experience; the air muſt here be condenſed to a very great degree, and ſend forth from theſe high regions a perpetual wind to every ſide, which occaſions almoſt all the peculiarities that have been remarked in theſe climates: For by oppoſing the general current of the trade-wind upon the eaſtern part of theſe continents, they produce theſe deluges of rain which ſupply the immenſe rivers of the *Amazons*, *La Plata*, &c. theſe do not, like the *Nile* and *Gambia*, ſwell only at a particular ſeaſon, and then ſhrink into a diminutive ſize again, but continue throughout the whole year, with leſs variation of ſize, to pour their immenſe floods of water into the ocean. Theſe cold winds likewiſe ſtretching to the weſtward, at a conſiderable diſtance above the warmer regions of the ſea-coaſt, at length deſcend as low as the ocean, and form the general trade-wind, and occaſion that unuſual degree of cold which mariners have ſo often complained of even under the *line* to the weſtward of America. To the ſame cauſe alſo muſt we attribute the thick fogs ſo common upon the ſouthern parts of *Chili* and along the coaſts of *Peru*, with the other peculiarities of that ſingular climate about *Lima* and the kingdom of *Valles* in South America; for the vapours which are exhaled in ſuch great abundance in the warm regions on the ſea ſhore, are, at a little height above the earth, condenſed by the cold winds which come from the mountains, and form theſe thick miſts which are ſo often obſerved in this climate. The ſame effects are felt in ſome degree on the ſimilar coaſt of Africa. But as the mountains of *Africa* are not ſo high as the *Andes* of *America*, nor approach ſo near the weſtern coaſt, the effects are leſs ſenſible here than in *America*. The great height of the *Andes* above the mountains of the ſimilarly ſituated country of *Africa*, is the only reaſon why the effects on that coaſt are not felt to an equal degree, although ſimilar in kind.

A more ſingular deviation from the general trade-wind is obſerved to take place on the *African* and *American* coaſts to the north of the line, than thoſe we have taken notice of to the ſouth of it. For it is obſerved, that from *California* to the bay of *Panama*, all along the coaſts of *New Spain*, the winds blow almoſt conſtantly from the weſt or SW, nearly directly oppoſite to the trade-wind; and on the coaſt of *Africa* from *C. Bayador* to *C. Verde*, they blow chiefly from the NW, ſtanding in upon the ſhore; from thence the wind bends gradually more and more from the north to the weſt, and ſo round to the SW, all along the coaſt of *Guinea*, as will be diſtinctly ſeen by the map. After what we have ſaid of the winds on the ſouthern parts of theſe regions, it will be unneceſſary to ſpend much time in explaining the cauſe of theſe peculiarities, as it will evidently appear that they are nearly the ſame, the variations here obſerved being occaſioned by the particular direction of the coaſt. Thus, along the coaſt of *New Spain*, the wind blows nearly the ſame direction in every place, as there are no remarkable bendings on the coaſt; being uniformly drawn towards the ſhore, by the great heat of the low part of the continent near the ſea; which in theſe regions is always more heated than the water of the ocean, and occaſions that inflection. But as the coaſt of *Africa* is more irregular, the winds alſo are found to be more different in their direction. To the north of *C. Verde*, as the coaſt ſtretches nearly *ſouth* and *north*, the wind, being drawn towards it a little, blows from the NW. But beyond that, the coaſt bends more eaſtward to *C. Palmas*; from which it runs E or NE all along the coaſt of Guinea, the wind ſhifting gradually more and more to the weſt, ſtill pointing in upon the coaſt. And as there is nothing to oppoſe the current of air, which comes from the ſouth, along the coaſt of *Angola*, it ſtretches forward till it comes within the influence of the coaſt of *Guinea*, and is there drawn in towards the ſhore in a SW direction. But as it is only the lower regions of the coaſt of *Guinea* which are ſo much warmed, the high mountains within continuing cold; the northerly wind coming from theſe meeting and oppoſing the ſoutherly winds in the higher regions of the air, by their mutual conflicts occaſion thoſe inceſſant rains and tremendous thunder ſo remarkable along the whole of this uncomfortable coaſt.

It has been often obſerved by mariners, that there is a track of ſea to the weſt of *Guinea* from five to ten degrees of north latitude, in which the trade-wind blows with leſs ſteadineſs than in any other part of that ocean, being almoſt conſtantly troubled with calms and tornadoes; the cauſe of which the reader will perceive by inſpecting the map; as he will eaſily ſee that the winds are drawn from this quarter almoſt in every direction; ſo that there can be here no conſtant wind; but being exhauſted of its air, it muſt become lighter than the circumjacent parts, and muſt then be ſup-

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plied from either ſide, as chance or occaſional circumſtances may direct, which occaſions thoſe ſudden flurries and tornadoes here obſerved.

Before we take our leave of this ſubject, it is neceſſary to obſerve, that in the Bay of *Panama*, the winds between *September* and *March* are eaſterly; but from *March* till *September* they blow chiefly from the SSW; that is, during the winter months, while the ſun is far from them, the winds are off ſhore; and during the ſummer months, the land being heated to a conſiderable degree, they are drawn towards the ſhore as uſual. It is remarkable, however, that this is the only part on the weſt of a large continent where the wind ſhifts regularly at different ſeaſons; which ſeems to be occaſioned by the great height of the *Iſthmus* of *Darien*, and the Terra Firma to the eaſt of it, and the nearneſs of theſe to the ſea, in compariſon of the mountains near *Benin* on the ſimilarly ſituated coaſt of Africa; which is greatly aſſiſted by the deepneſs of the bay, which, by bending ſo much to the eaſtward from *C. Lorenzo*, is in a great meaſure ſcreened from the force of the ſouth winds, which allows the winter breeze to extend itſelf upon the bay with more facility. We ought here alſo to remark, that along the coaſt of *Mexico*, between *C Pelanco* and *Guatimala*, there are land winds which blow in the months of *May*, *June*, and *July*, called by the Spaniards *Popogaios*. They greatly reſemble the *Summaſenta* winds in the *Bay of Campeachy*, as they blow both night and day a moderate breeze without intermiſſion, ſometimes three or four days or a week together. But as theſe blow from the land in *ſummer* only, whereas the *Summaſenta's* blow only in winter, they muſt be occaſioned by a different cauſe; which ſeems to be this: As the continent which divide the *ſouth ſea* from the *Bay of Mexico* and *Gulf of Hunduras*, is but of very ſmall breadth, and in many places very high ground, the heat which it receives from the ſun in *ſummer* is not ſo great as on the ſimilar coaſt of Africa: and as the trade-wind coming from the *great Atlantic* ocean ſweeps along the eaſtern part of the *American* coaſt from *C. St Auguſtine* to the *Bay of Honduras* with very great violence at that ſeaſon, the ſmall heat of this narrow continent, is not ſufficient to ſtop it entirely during that ſeaſon; ſo that at ſome times it blows for a ſhort time quite acroſs it, and occaſions thoſe winds called *Popogaios*.

Beſides theſe more general winds, there are likewiſe ſome particular winds which are only felt in particular places at certain times, whoſe effects are ſo ſingular as to merit attention; ſome of which we ſhall here take notice of. In the *Gulf of Perſia*, particularly at *Ormuz*, during the months of *June* and *July*, there ſometimes blows from the weſt, for a day or two together, a hot ſuffocating fiery wind, which ſcorches up and deſtroys any animal that may be expoſed to it; for which reaſon, almoſt every body leave their habitations at *Ormuz* during theſe two months, and retire to the mountoins near *Schiras* in *Perſia*, where they enjoy a more comfortable climate. To explain the cauſe of which, it is neceſſary to obſerve, that along all the coaſts of *Aſia*, to the north of the *Indian ocean*, the diurnal ſea and land breezes take place, as in every part of the torrid zone; by means of which, the monſoons are not felt cloſe in upon the ſhores. But as the monſoon continues to blow regularly at a ſmall diſtance from ſhore, ſo in all probability it continues its courſe without interruption at a ſmall diſtance above the ſurface of the earth. Now when the monſoon is in its greateſt vigour, its influence will ſometimes deſcend even as low as the ſurface of the earth, and, interrupting the courſe of the *breezes*, hurry along with it theſe warm vapours, which ought to have aſcended upwards, and produced the ſalutary ſea-breeze; and as the earth is thus deprived of the refreſhing influence and moiſture of the ſea-breeze, the air, by the ſtrong reverberation of the ſun-beams from ſuch dry and ſandy countries as *Arabia*, muſt ſoon be heated to an amazing degree, and produce theſe hot and ſuffocating winds. It is alſo remarkable, that theſe hot winds are more often experienced near headlands, where the ſea-breezes are weakeſt, which ſeems to confirm this hypotheſis. Winds ſimilar to theſe in kind, though not in degree, are felt upon the coaſt of *Coromandel* during the months of *June*, *July*, and *Auguſt*, while the *weſt* monſoon reigns; and on the *Malabar* coaſt they are likewiſe felt in the months of *December* and *January*, while the *eaſt* monſoon reigns; but theſe are much leſs powerful than either of the others. As theſe hot winds always come from the land, they are known upon theſe coaſts by the name of *Terreno's*.

It has likewiſe been obſerved, that on the coaſt of *Africa* to the north of *C. Verde*, during the months of *December*, *January*, and *February*, there ſometimes blows, for a day or two together, an *eaſterly* wind, ſo very intenſely cold as to be almoſt as deſtructive as the warm winds at *Ormuz*. We have already in ſome meaſure explained the cauſe of this phenomenon. During theſe months, when the ſun is far from them, his influence is leſs felt than at other ſeaſons, and the northerly wind upon the coaſt is of courſe weakened, inſomuch that the cold produced by the mountains in the heart of the country being now in its greateſt degree of force, burſts its uſual confinement for a time, ſpreading to the weſt with great violence, and producing thoſe uncommon effects already mentioned. Thoſe who ſail on theſe coaſts, diſtinguiſh this particular wind by the name of *Hermatan*.

Theſe are the principal winds, whether conſtant or periodical, that take place within the *tropics*; and thus ſimple are their cauſes.

The ſucceſſion of ſea and land breezes renders the Torrid Zone not only habitable but comfortable. Beſides, as theſe currents of cold air, ruſhing from each ſide of the globe, and carrying along with them vaſt quantities of aqueous vapours which they collect from the ſurface of the earth in their courſe, meet and oppoſe one another at that part of the atmoſphere where the influence of the ſun is greateſt at the time, the water is there forced from the clouds in ſuch prodigious quantities, as to produce a diverſity of ſeaſons in the Torrid Zone, ſomething ſimilar to what is experienced in more temperate climates; with this difference however, that whereas, in temperate climates, the warmeſt and moſt comfortable ſeaſon is when the ſun approaches neareſt perpendicular to them, in theſe warmer climates the heavy rains which fall upon them at that ſeaſon moderates the heat, and prevents the ſun from having ſuch an effect as at other times; ſo that their coldeſt and moſt inconſtant weather, which they call *winter*, is at that ſeaſon, when, without this cauſe, they would be expoſed to the ſun's moſt powerful influence.

We ſhall only take notice of one other inſtance of the happy effects produced on our globe, by the laws of nature with reſpect to winds. We have ſeen, that in the great *Atlantic* and *Pacific* oceans, the trade-wind blows conſtantly from the *eaſterly* points throughout the whole year, ſo that ſhips

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ſhips ſail from *eaſt* to *weſt* within the tropics with the utmoſt facility; but it is abſolutely impoſſible in theſe ſeas to ſail from *weſt* to *eaſt*, as the wind would be conſtantly againſt them; ſo that ſhips bound for any port to the *eaſtward* in theſe regions, muſt ſtand to the *north* or *ſouth* till they are beyond the limits of the *trade-winds*, where they meet with *variable breezes*, by the help of which they ſail to the *eaſtward*. But if the ſame conſtant *trade-wind* had taken place in the northern part of the *Indian Ocean*, it would have been impoſſible to have ſailed to the *eaſtward* at all; becauſe the continent of Aſia would have prevented the ſhips from ſailing far enough north to find the variable winds. But here, as in almoſt every caſe in which the operations of nature are concerned, we find, that what produceth the diſeaſe, at the ſame time furniſheth a remedy: for that very continent which would have ſtood in our way going northward, draws the wind towards itſelf at one ſeaſon, which makes that courſe of navigation unneceſſary, the ſhifting of the *monſoons* ſupplying a nearer and more commodious courſe. Thus we ſee, that where ever the ſea is open to the ſouth or north, near the *tropics*, ſo as that ſhips are at freedom to reach the *variable winds*, the *trade-wind* conſtantly blows in one direction; but where-ever there is any extent of continent within the verge of the *Torrid Zone*, ſo as that they could not be at liberty to reach the variable winds, there the courſe of the trade-wind is altered, being drawn towards it in ſummer, and from it in winter, forming that ſhifting wind called *monſoons*. From which we may naturally infer, that as there are no *monſoons* in the *Pacific* or *Atlantic*, or in the weſtern part of the *Indian* ocean, to the ſouth of the *line*, there are no extenſive continents near the tropics in either of theſe places.

POE

PNEUMATOCELE: See MEDICINE and SURGERY.

PNEUMONICS, in pharmacy, medicines proper in diſeaſes of the lungs, in which reſpiration is affected.

PO, a great river of Italy, riſing in the Alps, and running firſt eaſt, ſoon after turns directly north through Piedmont, where it receives the Doria; then paſſing north-eaſt, it diſcharges itſelf by ſeveral channels into the gulph of Venice.

POA, in botany, a genus of the triandria digynia claſs. The calix has two valves including ſeveral flowers; the ſpike is oval, with pointed valves. There are 20 ſpecies, twelve of them natives of Britain.

POCHARD, in ornithology. See ANAS.

PODAGRA, in medicine, the gout in the feet. See MEDICINE.

PODALIA, a province of Poland, bounded by Volhinia, and the Ruſſian Ukrain, on the north and north-eaſt; by Budziac Tartary, on the ſouth-eaſt; by the river Nieſter, which ſeparates it from Beſſarabia and Moldavia, on the ſouth-weſt; and by the province of Red-Ruſſia, on the north-weſt.

PODENSTIEN, a town of Germany, in the circle of Franconia: ſituated in E. long. 11° 35′, N. lat. 49° 50′.

PODEX, in anatomy. See ANUS.

PODOPHYLLUM, in botany, a genus of the polyandria monogynia claſs. The corolla has nine petals, and the calix three leaves; the capſule is oval and unilocular. There are two ſpecies, none of them natives of Britain.

POEM, a compoſition in verſe of a due length and meaſure.

Poems are generally denominated from the ſubject-matter, as the apobaterion, epibaterion, epinicion, epithalamium, genethliac, elegiac, ſatirie, epitaph, panegyric, lyric, paſtoral, *&c.* and others from the manner of narration, as epic, dramatic, *&c.* to which may be added odes, eclogues, and idylliums. To this head may alſo be referred ſeveral other compoſitions of a leſs ſerious kind, as the acroſtic, enigma, anagram, cento, echo, *&c.*

POET, the author of a poem. See POEM.

POETRY, the art of compoſing poems, or pieces in verſe; or, as defined by Voſſius, the art of repreſenting actions in metre.

POE

Voſſius thinks that love was the firſt occaſion of poetry; which is not improbable, conſidering that this affection is coeval with mankind, is univerſal, and naturally productive of poetry. Yet it undoutedly owes its increaſe and progreſs to religion. Dacier indeed calls it the offspring of religion; and it is certain, in the earlieſt ages of the world, that it was uſual to ſing hymns to the honour of the gods upon ſolemn feſtivals. Du Bos thinks that poetry has been employed in all ages, even by the moſt unpoliſhed nations, to preſerve the memory of paſt events. Its principal aim is to flatter our ſenſes and imagination: for, according to Plato, it awakes the ſpiritual empire of the ſoul. Every kind of poetry charms us in proportion to its object, ſays Du Bos; and to be very affecting, it ought to be very exact. It is not the ſame with poetry as with other arts; for an ignorant perſon may judge of poetry by the impreſſion it makes on him: whence all men have a right to give their opinion concerning a piece of poetry, and this judgment ought to be founded on experience rather than on argumentation. Poetry is an art where every thing ſhould pleaſe. It is not enough to exhibit nature, which in certain places and circumſtances is rude and unpleaſant: but the poet muſt chuſe in her what is beautiful from what is not: whence a poet ought to chuſe, for the ſubject of his imitation, ſomething that is naturally affecting. There is a particular rhetoric for poetry, which conſiſts in diſcerning very preciſely what ought to be ſaid figuratively, and what to be ſpoken ſimply; and in knowing where ornament is required, and where not: yet the ſtyle ſhould be copious, and every ſpecies of writing in this art ſhould have a diction proper to itſelf. The qualifications, then, neceſſary for poetry, or thoſe which form a good poet, are ſeldom found united in one perſon: he muſt have an extraordinary genius, great natural gifts, a wit juſt, piercing, ſolid, and univerſal; an underſtanding clear and diſtinct; an imagination neat and pleaſant; an elevation of ſoul that depends not on art, or ſtudy, and which is purely a gift of heavan, and muſt be ſuſtained by a lively ſenſe and vivacity, a great judgment to conſider wiſely of things, and a vivacity to expreſs them with that grace and abundance which gives them beauty. In fine, to accompliſh a poet, is required a temperature of wit and fancy, of ſtrength and ſweetneſs, of penetration and delicacy; but, above all,

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all, he muſt have a ſovereign eloquence, and a profound capacity. Theſe are the qualities that muſt concur together to form the genius of a poet, and ſuſtain his character.

POICTIERS, the capital of Poictou, in France, ſituated on an eminence, near the river Clain: E. long. 15′, N. lat. 46° 40′.

POICTOU, a territory of France, in the province of Orleanois, ſituated ſouth of the river Loire, being bounded by the provinces of Anjou and Britany on the north, by Touraine and Berry on the eaſt, by Santoign, Angoumois, and Aunis on the ſouth, and by the ocean on the weſt. It is one hundred and fifty miles long, and ſeventy broad.

POINCIANA, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of five leaves, and the corolla of five petals; the ſtamina are long. There are three ſpecies, all natives of India.

POINT, a term uſed in various arts.

Point, *punctum*, in geometry, as defined by Euclid, is a quantity which has no parts, or which is indiviſible.

Point, in grammar, a character uſed to mark the diviſions of diſcourſe.

Points, in heraldry, are the ſeveral different parts of an eſcutcheon, denoting the local poſitions of any figure. There are nine principal points in an eſcutcheon, as repreſented in Plate CXLV. fig. 2. where A ſhews the dexter chief; B, the preciſe middle chief; C, the ſiniſter chief; D, the honour-point; E, the feſs-point, called alſo the centre; F, the nombril-point, that is, the navel-point; G. the dexter baſe; I, the ſiniſter baſe; H, the preciſe middle baſe.

POISON, in medicine. See Medicine, p. 152.

POLAND, a large kingdom of Europe, ſituated between 16° and 34° eaſt longitude, and between 46° and 57° north latitude; bounded by Ruſſia on the north and eaſt; by Beſſarabia, Moldavia, Tranſilvania, and Hungary, on the ſouth; and by Pomerania, Brandenburg, and Sileſia, on the weſt; being almoſt ſquare, and ſeven hundred miles over either way.

POLAR, in general, ſomething relating to the poles of the world, or poles of the artificial globes: thus we meet with polar circles, polar dial, polar projection, *&c.*

POLARITY, the quality of a thing conſidered as having poles; but chiefly uſed in ſpeaking of the magnet.

POLE, in aſtronomy, one of the extremities of the axis on which the ſphere revolves.

Pole, Perch, or Rod, in ſurveying, is a meaſure containing ſixteen feet and a half.

Pole, or Polar star, is a ſtar of the ſecond magnitude, the laſt in the tail of urſa minor. See Astronomy, p. 486.

Pole-cat. See Mustela.

POLEMICAL, in matters of literature, an appellation given to books of controverſy, eſpecially thoſe in divinity.

POLEMONIUM, in botany, a genus of the pentandria monogynia claſs. The corolla conſiſts of five ſegments; the ſtigma is trifid; and the capſule has three cells. The ſpecies are five, only one of which, *viz.* the cæruleum, or great valerian, is a native of Britain.

POLIANTHES, in botany, a genus of the hexandria monogynia claſs. The corolla is bell-ſhaped; and the filaments are inſerted into the faux. There is but one ſpecies.

POLICY, or Polity, in matters of government. See Polity.

For policies of aſſurance, or inſurance on ſhips, houſes, lives, *&c.* ſee Insurance.

POLISHER, or Burnisher, among mechanics, an inſtrument for poliſhing and burniſhing things proper to take a poliſh. The gilders uſe an iron-poliſher to prepare their metals before gilding, and the blood-ſtone to give them the bright poliſh after gilding.

POLISHING, in general, the operation of giving a gloſs or luſtre to certain ſubſtances, as metals, glaſs, marble, *&c.* See Metal, Glass, *&c.*

POLITICS, the firſt part of œconomy, conſiſting in the well governing and regulating the affairs of a ſtate, for the maintenance of the public ſafety, order, tranquillity, and morals.

POLITY, or Policy, denotes the peculiar form and conſtitution of the government of any ſtate or nation; or, the laws, orders, and regulations, relating thereto.

Polity differs only from politics, as the theory from the practice of any art.

POLL, a word uſed in ancient writings for the head: hence to poll, is either to vote or to enter down the names of thoſe perſons who give in their votes at an election.

POLLACK, in ichthyology. See Gadus.

POLLEX, in anatomy, denotes either the thumb or great toe, according as either manus or pedis is added to it. See Anatomy.

POLLUX, in aſtronomy, a fixed ſtar of the ſecond magnitude in the conſtellation gemini, or the twins. See Astronomy, p. 487.

POLOCZK, the capital of the palatinate of the ſame name, in the duchy of Lithuania, in Poland: E. long. 29°, N. lat 56° 30′.

POLYACANTHA, in botany. See Carduus.

POLYADELPHIA, in botany. See Botany, p. 635.

POLYANDRIA, in botany. See Botany, p. 635.

POLYANTHUS, in botany. See Primula.

POLYCHREST, in pharmacy, ſignifies a medicine that ſerves for many uſes, or that cures many diſeaſes.

Sal Polychrest, a compound ſalt made of equal parts of ſalt-petre and ſulphur, laid on a red-hot crucible.

POLYCNEMUM, in botany, a genus of the triandria monogynia claſs. The calix conſiſts of three leaves, and the corolla of five petals; and it has but one round ſeed. There is but one ſpecies, a native of Germany.

POLYGALA, in botany, a genus of the diadelphia octandria claſs. The calix conſiſts of five leaves; and the pod is cordated, and has two cells. There are 24 ſpecies, only one of them, *viz.* the vulgaris, or milk-wort, a native of Britain.

POLYGAMIA, in botany. See Botany, p. 635.

POLYGAMY, a plurality of wives or huſbands, in the poſſeſſion of one man or woman, at the ſame time.

Many arguments have been offered to prove the unlawfulneſs of polygamy; one of the principal of which is, that the males and females brought into the world are nearly on a balance; only abating for a ſmall exceſs on the ſide of the males, to make up for the extraordinary expence thereof in war and at ſea: whence it evidently follows, that nature only intends one wife, or one huſband, for the ſame perſon; ſince if they have more, ſome muſt go without any at all. Hence it is juſtly concluded, that

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that the Chriſtian law, which prohibits polygamy, is more agreeable to the law of nature than the Mahometan, and, we may add, than the Jewiſh law, by which polygamy was tolerated.

POLYGLOTT, among divines and critics, chiefly denotes a bible printed in ſeveral languages. See BIBLE.

POLYGON, in geometry, a figure with many ſides, or whoſe perimeter conſiſts of more than four ſides at leaſt: ſuch are the pentagon, hexagon, heptagon, *&c.*

POLYGONATUM, in botany. See CONVALLARIA.

POLYGONUM, in botany, a genus of the octandria trigynia claſs. It has no calix; the corolla has five ſegments; and there is but one angular ſeed. The ſpecies are 27, eleven of them natives of Britain.

POLYGYNIA, among botaniſts. See BOTANY, p. 635.

POLYHEDRON, in geometry, denotes a body or ſolid comprehended under many ſides or planes.

POLYHEDRON, in optics, is a multiplying glaſs or lens, conſiſting of ſeveral plane ſurfaces diſpoſed into a convex form. See OPTICS.

POLYMATHY, denotes the knowledge of many arts and ſciences.

POLYMNIA, in botany, a genus of the ſyngeneſia polygamia neceſſaria claſs. The receptacle is paleaceous; it has no pappus; and the calix conſiſts of ten leaves. There are two ſpecies, both natives of America.

POLYPUS, in zoology, a ſpecies of the hydra, which, although cut in a thouſand pieces, and in every direction, ſtill exiſts, and each ſection becomes a compleat animal.

POLYPETALOUS, among botaniſts, an epithet applied to ſuch flowers as conſiſt of ſeveral petals, or flower-leaves.

POLYPODIUM, in botany, a genus belonging to the cryptogamia filices claſs. The fructifications are diſpoſed in round ſpots on the margin of the leaf. There are 65 ſpecies, 14 of them natives of Britain.

POLYPREMUM, in botany, a genus of the tetrandria monogynia claſs. The calix conſiſts of four leaves, and the corolla, which is rotated, of four ſegments; the capſule is compreſſed, and bilocular.

POLYPUS *of the heart*. See MEDICINE, p. 158.

POLYSYLLABLE, in grammar, a word conſiſting of more ſyllables than three; for when a word conſiſts of one, two, or three ſyllables, it is called a monoſyllable, diſſyllable, and triſyllable.

POLYTHEISM, in matters of religion, the doctrine or belief of a plurality of gods.

POLYTRICHUM, in botany, a genus of the cryptogamia muſci claſs. The anthera is operculated, and the calyptra hairy. There are three ſpecies, one of them, *viz.* the commune, or great golden maidenhair, a native of Britain

POMEGRANATE. See PUNICA.

POMERANIA, a province of Upper Saxony, in the north of Germany; bounded by the Baltic-ſea, on the north; by Poland, on the eaſt; by another part of Poland, and Brandenburg, on the ſouth; and by the duchy of Mecklenburg, on the weſt.

POMME', or POMMETTE', in heraldry, is a croſs with one or more balls or knobs at each of the ends.

POMMEL, or PUMMEL, in the menage, a piece of braſs, or other matter, at the top and in the middle of the ſaddle-bow.

POND-WEED, in botany. See POTAMOGETON.

PONDICHERRY, a town of India, on the Coromandel-coaſt, ſixty miles ſouth of Fort St. George.

PONTEDERIA, in botany, a genus of the hexandria monogynia claſs. The corolla conſiſts of one bilabiated petal cut into ſix ſegments; and the capſule has three cells. There are three ſpecies, none of them natives of Britain.

PONTEFRACT, a borough-town, eighteen miles ſouth-weſt of York. It ſends two members to parliament.

PONTIFICATE, is uſed for the ſtate or dignity of a pontif, or high prieſt; but more particularly, in modern writers, for the reign of a pope.

PONTON, or PONTOON, in war, denotes a little floating bridge made of boats and planks.

PONTUS, the ancient name of the countries ſituated on the ſouth ſide of the Euxine ſea, now a part of Aſiatic Turky.

POOL, in geography, a borough and port town of Dorſetſhire, ſituated on a bay of the Engliſh channel, twenty miles eaſt of Dorcheſter. It ſends two members to parliament.

POOLOWAY, one of the Banda or nutmeg-iſlands in the Indian ocean: E. long. 128°, S. lat. 3° 30′.

POOP, the ſtern of a ſhip, or the higheſt, uppermoſt, and hinder part of the ſhip's hull.

POOR, in law, an appellation given to all perſons who are in ſo low and mean a condition, as that they either are, or may become a burden to a pariſh.

POPAYAN, a province of South America, bounded by Terra-Firma, on the north; by New Granada, on the eaſt; by Peru, on the ſouth; and by the pacific ocean, on the weſt; ſituated between 75 and 80 degrees weſt longitude, and between the equator and 5 degrees of north latitude, being four hundred miles long, and about three hundred broad.

POPE, the ſovereign pontiff, or ſupreme head of the Romiſh church. The appellation of pope was anciently given to all Chriſtian biſhops; but about the latter end of the eleventh century, in the pontificate of Gregory VII. it was uſurped by the biſhop of Rome, whoſe peculiar title it has ever ſince continued.

POPE'S TERRITORIES, in Italy, are bounded by the Venetian territories, on the north; by the gulph of Venice, on the north-eaſt; by Naples, on the ſouth-eaſt; by the Tuſcan ſea, on the ſouth-weſt; and by the duchy of Tuſcany, on the north-weſt, almoſt encompaſſing that duchy on the land ſide; being about two hundred and twenty miles long, and from twenty to one hundred and forty in breadth.

POPE, in ornithology. See ALCA.

POPLAR, in botany. See POPULUS.

POPLITÆUS, in anatomy. See ANATOMY, p. 208.

POPPY, in botany. See PAPAVER.

POPULAR, ſomething that relates to the common people.

POPULUS, the poplar, in botany, a genus of the dioecia octandria claſs The corolla of the male is turbinated, oblique, and entire; the ſtigma of the female is quadrifid; and the capſule has two cells, containing many pappous ſeeds There are five ſpecies, three of them natives of Britain, *viz.* the alba, or white poplar; the nigra, or black poplar; and the tremula, or trembling poplar, or aſp.

PORCELAIN, a fine ſort of earthen-ware, chiefly manufactured in China, and thence called china-ware. The moſt juſt idea we can form of the porcelain, or china-ware,

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ware, is, that it is an half vitrified ſubſtance, or manufacture, in a middle ſtate between the common baked earthen ware of our vulgar manufactures, and true glaſs. This is the eſſential and diſtinctive character of porcelain; and it is only by conſidering it in this light, that we are to hope of arriving at the perfect art of imitating it in Europe. This attempt is to be made on theſe principles in two different manners The one by finding ſome appropriated matter, on which fire acts with more than ordinary ſtrength, in the time of its paſſing from the common baked ſtate of earthen ware into that of glaſs. The other is to compoſe a paſte of two ſubſtances, reduced to a powder; the one of which ſhall be of force to reſiſt a very violent fire, ſo as not to become vitrified in it; and the other a matter very eaſily vitrifiable. In the firſt caſe, the matter is to be taken out of the fire at the time when it is imperfectly vitrified; and in the other, the compound maſs is to remain in the furnace, till the one ſubſtance which is the more eaſily vitrifiable is truly vitrified; and being then taken out, the whole will be what porcelain is, a ſubſtance in part vitrified, but not wholly ſo. The firſt method is that by which the European porcelain has been generally made, which though it may be very beautiful, yet it is always eaſy to diſtinguiſh even the fineſt of it from the china-ware: and the nature of the two ſubſtances appears evidently different: theſe owing all their beauty to their near approach to vitrification, are made to endure a long and violent fire, and are taken from it at a time when a little longer continuance ſhould have made them perfect glaſs; on the contrary, the china-ware being made of a paſte, part of which is made of a ſubſtance in itſelf ſcarce poſſible to be vitrified, bears the fire in a yet much more intenſe degree than ours, and is in no danger of running wholly into glaſs from it.

The two ſubſtances uſed by the Chineſe, are well known by the names of petunſe and kaolin; and on examining theſe, it appears very evident, that we have in Europe the very ſame ſubſtances, or at leaſt ſubſtances of the very ſame nature, capable of being wrought into porcelain equally beautiful and fine.

PORCELAIN-SHELL. See CYPRÆA.

PORCUPINE, in zoology. See HISTRIX.

PORE, in anatomy, a little interſtice or ſpace between the parts of the ſkin, ſerving for perſpiration.

PORELLA, in botany, a genus of moſſes, the anthera of which is multilocular and foraminoſe. See MOSS.

PORIA, a genus of funguſes, growing horizontally; but having its under ſide not formed into lamellæ, but full of little holes or pores.

There are a great many ſpecies of poria, among which is the agaric of the ſhops. See AGARIC, and STYPTIC.

PORPESSE, in ichthyology. See DELPHINUS.

PORPHYRY, in natural hiſtory, a kind of ſtone of a plain uniform maſs, ſpotted with ſeparate concretions, of great hardneſs, giving fire with ſteel, not fermenting with acids, and very ſlowly and difficultly calcining in a ſtrong fire.

Porphyry is of ſeveral ſorts; as, 1. The porphyry of the ancients, which is a moſt elegant maſs of an extremely firm and compact ſtructure, remarkably heavy, and of a fine ſtrong purple, variegated more or leſs with pale, red, and white: its purple is of all degrees, from the claret-colour to that of the violet; and its variegations are rarely diſpoſed in veins, but ſpots, ſometimes very ſmall, and at others running into large blotches. It is leſs fine than many of the ordinary marbles; but it it excells them all in hardneſs, and is capable of a moſt elegant poliſh. It is ſtill found in immenſe ſtrata in Egypt. 2. The hard red lead-coloured porphyry, variegated with black, white, green. This is a moſt beautiful and valuable ſubſtance. It has the hardneſs, and all the other characters of the oriental porphyry; and even greatly excells it in brightneſs, and in the beauty and variegation of its colours. It is found in great plenty in the iſland of Minorca; and is extremely worth importing, for it is greatly ſuperior to all the Italian marbles. 3. The hard, pale-red porphyry, variegated with black, white, and green. This is of a pale fleſh-colour; often approaching to white. It is variegated in blotches from half an inch to an inch broad. It takes a high poliſh, and emulates all the qualities of the oriental porphyry. It is found in immenſe ſtrata in Arabia Petræa, and in the Upper Egypt: and in ſeparate nodules in Germany, England, and Ireland.

PORPHYRY-SHELL. See MUREX.

PORRUM, in botany, See ALLIUM.

PORT-GREVE, or PORT-GRAVE, was formerly the principal magiſtrate of maritime towns. The chief magiſtrate of London was anciently called by this name, till Richard I. cauſed the city to be governed by two baliffs; ſoon after which king John granted the city a mayor.

PORT-L'ORIENT, in geography, a fortreſs and port-town of Britany in France, at the mouth of the river Blavet: W. long. 3° 15′, N. lat. 47° 42′.

PORT-LOUIS, a port-town of Britany in France, ſituated in the bay of Biſcay: W. long. 3° 6′, N. lat. 47° 42′.

PORT-MAHON, a port-town of the iſland of Minorca, ſituated on a fine bay at the eaſt end of the iſland, in E. long. 4° 6′, N. lat. 39° 50.

PORT-ROYAL, the name of two monaſteries of Ciſtercian nuns, in the dioceſe of Paris; the one near Chevreuſe, at the diſtance of five leagues from Paris, called Port-Royal of the fields; and the other in Paris, in the ſuburbs of St James.

The nuns of the former of theſe monaſteries, proving refractory, were diſperſed; when many eccleſiaſtics, and others who were of the ſame ſentiments as theſe religious, retired to Port Royal, took apartments there, and printed many books: hence the name of Port-Royaliſts was given to all of their party, and their books were called books of Port-Royal: from hence we ſay the writers of Port Royal, Meſſieurs de Port-Royal, and the tranſlations and grammars of Port-Royal.

PORT-ROYAL, in geogfaphy, a port-town, ſituated in the extremity of a long point of land, in the ſouth-eaſt part of the iſland of Jamaica: W. long. 77°, N. lat. 17° 30′.

PORT-ROYAL, an iſland on the coaſt of South-Carolina, which, with the neighbouring continent, forms one of the moſt commodious harbours in the Britiſh plantations: W. long. 80°, N lat. 31° 45.

PORTA, or VENA PORTA, in anatomy. See ANATOMY, p. 244.

PORTATE, or a CROSS PORTATE, in heraldry, a croſs which does not ſtand upright, as croſſes generally do, but lies acroſs the eſcutcheon in bend, as if it were carried

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carried on a man's ſhoulders. See Plate CXLV. fig. 3.

PORTRENTRU, a city of Switzerland, in the biſhoprick of Baſil: E. long 7°, N. lat, 47° 30′.

PORTER, a kind of malt-liquor, which differs from ale and pale-beer in its being made with high-dried malt. See BREWING.

PORTICO, in architecture, a kind of gallery on the ground, ſupported by columns, where people walk under covert.

PORTLAND, a peninſula in Dorſetſhire, ſituated in the Engliſh channel, ten miles ſouth of Dorcheſter, famous for producing the beſt free-ſtone.

PORTO BELLO, a port-town of America, ſituated on the narroweſt part of the iſthmus of Darien: W. long. 82°, N. lat. 10°.

PORTO-RICO, an iſland in the American ocean, one hundred and twenty miles long, and ſixty broad, which produces ſugar, rum, and ginger: ſituated between 64° and 68° of W. long. and in 8° of N. lat. It is ſubject to Spain. The capital is alſo called Porto Rico, and St John's city.

PORTO SANTO, the leaſt of the Madeira iſlands, eighteen miles in circumference: W long. 16°, N. lat. 33°.

PORTRAIT, in painting, the repreſentation of a perſon, and eſpecially of a face, done from the life.

In this ſenſe we uſe the term portrait-painting, in contradiſtinction to hiſtory-painting, where a reſemblance of perſon is uſually diſregarded. Portraits, when as large as the life, are uſually painted in oil-colours; ſometimes they are painted in miniature with water-colours, crayons, paſtils, &c

PORTSMOUTH, a borough and port town of Hampſhire, ſituated on a fine bay of the Engliſh channel; it has one of the moſt ſecure, capacious, and beſt fortified harbours in England: W. long 1° 6′, N. lat 50° 48′. It ſends two members to parliament.

PORTUGAL, the moſt weſterly kingdom in Europe: it is about three hundred miles long, and one hundred broad; and is ſituated between 7° and 10° of W. long. and between 37° and 42° of N. lat. being bounded by Spain on the north and eaſt, and by the Atlantic ocean on the ſouth and weſt. This country is neither ſo hot nor ſo fruitful as Spain; it however produces plenty of grapes, olives, oranges and lemons

PORTUGALLICA TERRA, *earth of Portugal*, the name of a fine aſtringent bole, dug in great plenty in the northern parts of Portugal, and eſteemed a remedy againſt poiſons and venomous bites, and malignant fevers.

PORTULACA, in botany, a genus of the dodecandria monogynia claſs. The corolla conſiſts of five petals, and the calix of two ſegments. There are ſix ſpecies, none of them natives of Britain.

POSE′, in heraldry, denotes a lion, horſe, or other beaſt ſtanding ſtill, with all his four feet on the ground.

POSITIVE, a term of relation, oppoſed to negative. It is alſo uſed in oppoſition to relative or arbitrary: thus we ſay, beauty is no poſitive thing, but depends on the different taſtes of people

POSITIVE DEGREE, in grammar, is the adjective in its ſimple ſignification, without any compariſon. See GRAMMAR.

POSSE COMITATUS, in law, ſignifies the power of the county, or the aid and aſſiſtance of all the knights, gentlemen, yeomen, labourers, ſervants, apprentices, &c. and all others within the county that are above the age of fifteen, except women, eccleſiaſtical perſons, and ſuch as are decrepit and infirm.

This poſſe comitatus is to be raiſed where a riot is committed, a poſſeſſion kept upon a forcible entry, or any force of reſcue uſed, contrary to the king's writ, or in oppoſition to the execution of juſtice; and it is the duty of all ſheriffs to aſſiſt juſtices of the peace in the ſuppreſſion of riots, &c. and to raiſe the poſſe comitatus, or to charge any number of men for that purpoſe.

POSSESSION, in Scots law. See LAW, Tit. viii. 11.

POSSESSIVE, in grammar, a term applied to pronouns which denote the enjoyment or poſſeſſion of any thing either in particular or in common: as *meus*, mine; and *tuus*, thine.

POSSESSORY *action*, in Scots law. See LAW, Tit. xxx. 18.

POSSIBILITY, in law, is defined to be any thing that is altogether uncertain, or what may or may not be.

POSSIBILITY alſo denotes a non-repugnance to exiſting, in any thing that does not any way exiſt.

POSSIBLE, is ſometimes oppoſed to real exiſtence; and is underſtood of a thing which, though it does not actually exiſt, yet may exiſt; as a new ſtar.

POST, a courier or letter-carrier, or one who frequently changes horſes, poſted or placed on the road, for quicker diſpatch. The word is alſo applied to the houſes where ſuch a perſon takes up and lays down his charge.

In England, poſts were firſt eſtabliſhed by act of parliament in the twelfth year of the reign of Charles II. which enabled the king to ſettle a poſt-office, and appoint a governor.

Penny-POST, a poſt eſtabliſhed for the benefit of London and the adjacent parts; by which any letter or parcel not exceeding ſixteen ounces weight, is ſpeedily conveyed to and from all parts within ten miles of London.

POSTDAM, or POTSDAM, a town of Germany in the marquiſate of Brandenburg, ten miles ſouth-weſt of Berlin.

POSTHUMOUS, a child born after the death of his father, or taken out of the body of a dead mother; from whence it is frequently applied to the works of an author not publiſhed till after his deceaſe.

POSTING, among merchants, the putting an account forward from one book to another, particularly from the journal or waſte-book to the ledger. See BOOK-KEEPING.

POSTLIMINIUM, among the Romans, the return of one who had gone to ſojourn elſewhere, or had been baniſhed or taken by an enemy to his own country and ſtate.

POSTULATE, in mathematics, &c. is deſcribed to be ſuch an eaſy and ſelf-evident ſuppoſition, as needs no explication or illuſtration to render it intelligible; as, that a right line may be drawn from one point to another.

POTAMOGETON, in botany, a genus of the tetrandria tetragynia claſs. It has no calix, nor ſtylus; but has four petals, and four ſeeds. There are 12 ſpecies, 10 of them natives of Britain.

POTANCE, in heraldry, a croſs like that repreſented in Plate CXLV. fig. 4.

POT-

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POT-ASH, the lixivious-aſhes of certain vegetables, uſed in the making of glaſs, ſoap, &c.

The method of making pot-aſh is directed by Dr Shaw, as follows. Burn a quantity of billet-wood to grey aſhes; and taking ſeveral pounds of theſe aſhes, boil them in water, ſo as to make a very ſtrong lixivium, or lye. Let this lye be ſtrained through a coarſe linen cloth, to keep out any black parts of the half-burnt wood, that might happen to remain in the aſhes: then evaporate this ſtrained lye in an iron-pan over a quick fire almoſt to drineſs: then taking out the matter remaining at the bottom, and putting it into an iron-crucible, ſet it in a ſtrong fire till the matter is melted, and then immediately pour it out upon an iron-plate, where it ſoon cools, and appears in the form of a ſolid lump of pot-aſh. Much after this manner is pot-aſh made in the large way of buſineſs, for the ſervice of the ſoap-boiler, glaſs-maker, fuller, &c. but according to the difference of the wood or combuſtible matter employed, with the manner of turning it, and conducting the proceſs, different kinds of pot-aſh are prepared.

POTATOE, in botany. See CONVOLVULUS, of which it is a ſpecies.

POTENT, or POTENCE, in heraldry, a term for a kind of a croſs, whoſe ends all terminate like the head of a crutch. It is otherwiſe called the Jeruſalem croſs, and is repreſented in Plate CXLV. fig. 5.

POTENTIA, POWER, that whereby a thing is capable either of acting, or being acted upon.

POTENTIAL, in the ſchools, is uſed to denote and diſtinguiſh a kind of qualities, which are ſuppoſed to exiſt in the body in potentia only, by which they are capable in ſome manner of affecting and impreſſing on us the ideas of ſuch qualities, though not actually inherent in themſelves; in which ſenſe we ſay, potential heat, potential cold.

POTENTIAL, in medicine. Cauteries are diſtinguiſhed into actual and potential. See CAUTERY.

POTENTIAL, in grammar, an epithet applied to one of the moods of verbs. The potential is the ſame in form with the ſubjunctive. See GRAMMAR.

POTENTILLA, in botany, a genus of the icoſandria polygynia claſs. The calix conſiſts of ten ſegments, and the corolla of five petals; the ſeeds are round, naked, and fixed to the receptacle. There are 27 ſpecies, 8 of them natives of Britain.

This plant is ſaid to poſſeſs in a great meaſure the virtues of the peruvian bark.

POTERIUM, in botany, a genus of the monœcia polyandria claſs. The calix of the male conſiſts of five ſegments, that of the male has but one entire rough leaf. Neither of them have any corolla; the ſtamina of the male are from five to ten; and the ſtyli of the female are from two to five; and the ſeed is ſingle and oval. There are three ſpecies, one of which, *viz.* the ſanguiſorba, or burnet, is a native of Britain.

POTHOS, in botany a genus of the gynandria polyandri claſs. The ſpatha and ſpadix are roundiſh; it has no calix; the corolla has four petals; and the berry contains many ſeeds. There are ſeven ſpecies, none of them natives of Britain.

POTION, a liquid medicine, conſiſting of as much as can be drank at one draught.

POTOSI, a city of Peru in South America, ſituated at the bottom of a mountain of that name, in which is the richeſt ſilver-mine ever diſcovered: W. long. 67°, S. lat. 22°.

POTTERY, the manufacture of earthen ware, or the art of making earthen veſſels.

The wheel and lathe are the chief, and almoſt the only inſtruments uſed in pottery; the firſt for large works, and the laſt for ſmall. The potter's wheel conſiſts principally in the nut; which is a beam or axis, whoſe foot or pivot plays perpendicularly on the free-ſtone ſole or bottom. From the four corners of this beam, which does not exceed two feet in height, ariſe four iron-bars, called the ſpokes of the wheel; which forming diagonal lines with the beam, deſcend, and are faſtened at bottom to the edges of a ſtrong wooden circle, four feet in diameter, perfectly like the felloes of a coach-wheel, except that it has neither axis nor radii, and is only joined to the beam which ſerves it as an axis by the iron-bars. The top of the nut is flat, of a circular figure, and a foot in diameter; and on this is laid the clay which is to be turned and faſhioned. The wheel, thus diſpoſed, is encompaſſed with four different pieces of wood faſtened on a wooden frame. The hind-piece, which is that on which workman ſits, is made a little inclining towards the wheel: on the fore-piece are placed the prepared earth: on the ſide-pieces he reſts his feet; and theſe are made inclining, to give him more or leſs room. Having prepared the earth, the potter lays a round piece of it on the circular head of the nut; and ſitting down turns the wheel with his feet, till it has got the proper velocity: then, wetting his hands with water, he preſſes his fiſt or his fingers-ends into the middle of the lump, and thus forms the cavity of the veſſel, continuing to widen it from the middle; and thus turning the inſide into form with one hand, while he proportions the outſide with the other, the wheel conſtantly turning all the while, and he wetting his hands from time to time. When the veſſel is too thick, he uſes a flat piece of iron, ſomewhat ſharp on the edge, to pare off what is redundant; and when it is finiſhed, it is taken off from the circular head, by a wire paſſed underneath the veſſel.

The potter's lathe is alſo a kind of wheel, but more ſimple and ſlight than the former. Its three chief members are an iron-beam or axis, three feet and a half high, and two feet and a half diameter, placed horizontally at the top of the beam, and ſerving to form the veſſel upon; and another larger wooden wheel, all of a piece, three inches thick, and two or three feet broad, faſtened to the ſame beam at the bottom, and parallel to the horizon. The beam or axis turns by a pivot at the bottom in an iron-ſtand. The workman gives the motion to the lathe with his feet, by puſhing the great wheel alternately with each foot, ſtill giving it a greater or leſſer degree of motion, as his work requires. They work with the lathe, with the ſame inſtruments, and after the ſame manner as with the wheel. The mouldings are formed by holding a piece of wood or iron cut in the form of the moulding to the veſſel, while the wheel is turning round; but the feet and handles are made by themſelves, and ſet on with the hand; and if there be any ſculpture in the work, it is uſually done in wooden moulds, and ſtuck on piece by piece on the outſide of the veſſel.

POTTLE, an Engliſh meaſure containing two quarts.

POULTRY,

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POULTRY, all kinds of domeſtic birds brought up in yards, as cocks, hens, capons, ducks, turkeys, *&c.*

POUND, a ſtanding weight. See MONEY.

POUND alſo denotes a money of account; ſo called, becauſe the ancient pound of ſilver weighed a pound troy. See MONEY.

POUNDAGE, a ſubſidy of 12 d in the pound granted to the crown on all goods and merchandizes exported or imported; and if by aliens, one penny more.

POURPRESTURE, in law, is a wrongful incloſure, or encroachment upon another perſon's property.

POURSUIVANT, or PURSUIVANT, in heraldry, the loweſt order of officers at arms.

The pourſuivants are properly attendants on the heralds, when they marſhal public ceremonies Of theſe in England, there were formerly many; but at preſent there are only four, *viz.* blue-mantle, rouge-croſs, rouge-dragon, and portcullice. In Scotland, there is only one king at arms, who is ſtyled Lion; and has no leſs than ſix heralds, and as many purſuivants, and a great many meſſengers at arms, under him.

POURVEYANCE, or PURVEYANCE, in law, the providing corn, fuel, victual, *&c.* for the king's houſhold; and hence the officer who did ſo was termed pourveyor.

POWDER, in pharmacy, a dry medicine well broken, either in a mortar by grinding, or by chemical operations.

POWER, the faculty of doing or ſuffering any thing.

Power therefore is two-fold, *viz.* conſidered as able to make, or able to receive any change; the former whereof may be called active power, and the latter paſſive power. See METAPHYSICS.

POWER, in mechanics See MECHANICS.

POWER, in law, ſignifies, in general, a particular authority granted by any perſon to another to repreſent him, or act in his ſtead.

POWERS, in arithmetic and algebra, are nothing but the products ariſing from the continual multiplications of a number, or quantity, into itſelf. See ALGEBRA, p. 81. and ARITHMETIC, p. 420.

POX, or SMALL POX, in medicine. See MEDICINE, p. 75.

French POX See MEDICINE, p. 133.

PRACTICE, in arithmetic. See ARITHMETIC, p. 393.

PRAGMATIC SANCTION, in the civil law, is defined by Hottoman to be a reſcript, or anſwer of the ſovereign, delivered by advice of his council, to ſome college, order, or body of people, upon conſulting him on ſome caſe of their community. The like anſwer given to any particular perſon, is called ſimply reſcript. The term pragmatic ſanction, is chiefly applied to a ſettlement of Charles VI. emperor of Germany, who, in the year 1722, having no ſons, ſettled his hereditary dominions on his eldeſt daughter, the archduchess Maria Thereſa which was confirmed by the diet of the empire, and guaranteed by Great Britain, France, the States-general, and moſt of the powers in Europe.

PRÆCEPTIO HEREDITATIS, in Scots law. See LAW, Tit. xxvii. 33.

PRAGUE, the capital of Bohemia, ſituated on the river Mulda, in E. long. 14° 20′, N lat. 50°. This is a ſtrong fine city; and next to London, Paris, and Conſtantinople, the largeſt in Europe.

PRAMNION, in natural hiſtory, the name of a ſemi-pellucid gem.

This is a very ſingular ſtone, and of a very great concealed beauty: our lapidaries, when they meet with it, call it by the name of the black agate. It is of an extremely cloſe, compact, and firm texture, of a ſmooth and equal ſurface, and in ſhape very irregular, being ſometimes round, ſometimes oblong, and often flat; in ſize it ſeldom exceeds two inches. It appears, on a common inſpection, to be of a fine deep black; but held up againſt the ſun, or the light of a candle, it is an elegant red, clouded by a quantity of ſubtile black earth. We have it from the Eaſt-Indies,

PRASIUM, in botany, a genus of the didynamia gymnoſpermia claſs. The berries are four, each containing one ſeed. There are two ſpecies, none of them natives of Britain.

PRATIQUE, or PARTTIC, in commerce, a negotiation, or communication, of commerce, which a merchant-veſſel obtains in the port it arrives in, and the countries it diſcovers; hence to obtain a partique, is to obtain a liberty to frequent a port, to go aſhore, to buy and ſell, *&c.*

PREAMBLE, in law, the beginning of an act of parliament, *&c.* which ſerves to open the intent of the act, and the miſchiefs intended to be remedied by it.

PREBEND, the maintenance a prebendary receives out of the eſtate of a cathedral or collegiate church.

PREBENDARY, any eccleſiaſtic who enjoys a prebend.

PRECARIUM, in Scots law. See LAW, TIT XX. 9.

PRECEDENCE, a place of honour to which a perſon is entitled. This is either of courteſy or of right. The former is that which is due to age, eſtate, *&c.* which is regulated by cuſtom and civility; the latter is ſettled by authority, and, when broken in upon, gives an action at law.

PRECEDENT, in law, a caſe which has been determined, and which ſerves as a rule for all of the ſame nature.

PRECEPT, in law, a command in writing ſent by a chief juſtice, juſtice of the peace, *&c.* for bringing a perſon, record, or other matter, before him.

PRECEPT OF CLARE CONSTAT, in Scots law. See LAW, Tit. xxvii. 28.

PRECEPT OF SEISIN, in Scots law. See LAW, Tit. x. 15.

PRECESSION, in aſtronomy. See ASTRONOMY, p. 562.

PRECIPITANT, in chemiſtry, is applied to any liquor, which, when poured on a ſolution, ſeparates what is diſſolved, and makes it precipitate, or fall to the bottom of the veſſel. See CHEMISTRY.

The term precipitant is alſo uſed, in medicine, to denote any remedy that moderates the heat of the blood, by ſeparating, as is ſuppoſed, any heterogeneous matter contained therein.

PRECIPITATE, in chemiſtry, a ſubſtance which, having been diſſolved in a proper menſtrum, is again ſeparated from its ſolvent, and thrown down to the bottom of the veſſel by pouring ſome other liquor upon it.

PRECIPITATION. See CHEMISTRY, p. 69, 107.

PRECOGNITION, in Scots law See LAW, Tit. xxxiii.

PRECORDIA, in anatomy, a general name for the parts ſituated about the heart, in the fore-part of the thorax; as the diaphragm, pericardium, and even the heart itſelf, with the ſpleen, lungs, *&c.* See ANATOMY.

PREDECESSOR, properly ſignifies a perſon who has preceded or gone before another in the ſame office or employment; in which ſenſe, it is diſtinguiſhed from anceſtor.

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PREDESTINATION, in general ſignifies a decree of God, whereby, from all eternity, he ordained ſuch a concatenation of cauſes as muſt produce every event by a kind of neceſſity.

In this ſenſe, the Turks are great predeſtinarians; and on this account are much more daring in battle, and willingly encounter greater dangers than they would otherwiſe do. See MAHOMETANISM.

Predeſtination among Chriſtians, is uſed, in a more limited ſenſe, for a judgment or decree of God, whereby he has reſolved, from all eternity, to ſave a certain number of perſons, from thence called elect; ſo that the reſt of mankind being left in a ſtate of impenitence, are ſaid to be reprobated.

PREDICABLE, among logicians, denotes a general quality which may be predicated or aſſerted of ſeveral things: thus animal is predicable of mankind, beaſts, birds, fiſhes, *&c.* See LOGIC.

PREDICAMENT, among logicians. See LOGIC.

PREDICATE, in logic, that part of a propoſition which affirms or denies ſomething of the ſubject. See LOGIC.

PREENING, in natural hiſtory, the action of birds dreſſing their feathers, to enable them to glide the more readily through the air, *&c.*

For this purpoſe they have two peculiar glands on their rump, which ſecrete an unctious matter into a bag that is perforated, out of which the bird occaſionally draws it with its bill

PRE-EXISTENCE, the ſtate of a thing actually in being before another.

PREFACE, ſomething introductory to a book, to inform the reader of the deſign, method, *&c.* obſerved therein, and generally whatever is neceſſary to facilitate the underſtanding of a book.

PREFECT, in ancient Rome, one of the chief magiſtrates who governed in the abſence of the kings, conſuls, and emperors.

PREFECT *of the pretorium*, the leader of the pretorian bands deſtined for the emperor's guards, conſiſting, according to Dion, of 10,000 men, This officer, according to Suetonius, was inſtituted by Auguſtus, and uſually taken from among the knights.

PREGNANCY, the ſtate of a woman who has conceived, or is with child. See MIDWIFERY.

PREJUDICE does not mean a judgment merely as prior to another in reſpect of time, but as being paſſed before the things were duly conſidered and fully underſtood. Hence prejudice is ſometimes called anticipation, and a preconceived opinion.

PRELATE, an eccleſiaſtic raiſed to ſome eminent and ſuperior dignity in the church; as biſhops, archbiſhops, patriarchs, *&c.*

PRELIMINARY, in general, denotes ſomething to be examined and determined, before an affair can be treated of to the purpoſe.

PRELUDE, in muſic, is uſually a flouriſh or irregular air, which a muſician plays off-hand, to try if his inſtrument be in tune, and ſo lead him into the piece to be played

PREMISSES in logic, an appellation given to the two firſt propoſitions of a ſyllogiſm. See LOGIC.

PRENANTHES, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is naked; and the pappus is ſimple. There are ſeven ſpecies, only one of them, *viz.* the muralis, or ivy-leaved wild lettuce, is a native of Britain.

PREPOSITA NEGOTIIS DOMESTICIS, in Scots law. See LAW, Tit. vi. 18

PREPOSITION, in grammar. See GRAMMAR.

PREPUCE, in anatomy. See ANATOMY, p. 274.

PREROGATIVE *of the king*, that power which the king hath, not only over other perſons, but over the ordinary courſe of the common law, in right of his crown.

Such as, that he may pardon a perſon condemned to die, that the king's perſon is ſubject to no man's ſuit, his poſſeſſions cannot be taken from him by any violence, his goods are ſubject to no tribute, nor diſtrainable, *&c.*

PRESAGE, in antiquity, denotes an augury, or ſign of ſome future event; which was chiefly taken from the flight of birds, the entrails of victims, *&c.* See AUGURY, and ARUSPICES.

PRESBURG, the capital of Hungary, a large city on the north ſide of the Danube, fifty miles eaſt of Vienna: E. long. 17° 30', N. lat. 48° 20'.

PRESBYTA, in optics, a perſon whoſe eyes being flat, can ſee diſtant objects diſtinctly, but thoſe near confuſedly; which defect of ſight got this appellation, becauſe old people are naturally ſubject to it.

Spectacles, or convex glaſſes, are the only remedy for this defect.

PRESBYTER, in the primitive Chriſtian church, an elder, and of the ſecond order of eccleſiaſtics; the other two being biſhops and deacons.

PRESBYTERIANS, proteſtants, ſo called from their maintaining that the government of the church appointed in the New Teſtament was by preſbyteries; that is, by miniſters and ruling elders, aſſociated for its government and diſcipline.

The preſbyterians affirm, that there is no order in the church as eſtabliſhed by Chriſt and his apoſtles ſuperior to that of preſbyters; that all miniſters, being ambaſſadors of Chriſt, are equal by their commiſſion; and that elder or preſbyter, and biſhop, are the ſame in name and office: for which they alledge, *Acts* xx. 28, *&c.*

The only difference between them and the church of England, relates to diſcipline and church-government. Their higheſt aſſembly is a ſynod, which may be provincial, national, or œcumenical; and they allow of appeals from inferior to ſuperior aſſemblies; according to *Acts* xv. 2, 6, 22, 23. The next aſſembly is compoſed of a number of miniſters and elders, aſſociated for governing the churches within certain bounds. This authority they found upon *Acts* xi. 30. *Acts* xv. 4, 6, *&c.* The loweſt of their aſſemblies or preſbyteries conſiſts of the miniſter and elders of a congregation, who have power to cite before them any member, and to admoniſh, inſtruct, rebuke, and ſuſpend him from the euchariſt. They have alſo a deacon, whoſe office is to take care of the poor.

The ordination of their miniſters is by prayer, faſting, and impoſition of the hands of the preſbytery. This is now the diſcipline of the church of Scotland.

PRESCIENCE, in theology, fore knowledge, or the knowledge which God has of events before they come to paſs.

PRESCRIPTION, in Scots law. See LAW, Tit xxvi. 1.

PRESENCE, a term of relation uſed in oppoſition to abſence, and ſignifying the exiſtence of a perſon in a certain place.

PRESENT TENSE, in grammar. See GRAMMAR

PRE-

PRESENTATION, in Scots law. See LAW, Tit. v 7.

PRESS, in the mechanic arts, a machine of wood, or iron, ſerving to ſqueeze any body very cloſe, generally by means of a ſcrew. See MECHANICS.

PRESTER JOHN, or JEAN, an appellation given to the king of Abyſſinia or Ethiopia.

This name is altogether unknown in Ethiopia, where he is called the grand Negus.

PRESTO, in the Italian muſick, intimates to perform very quick. as *preſtiſſimo* does extremely ſo.

PRESTON, a borough-town, twenty miles ſouth of Lancaſter, which ſends two members to parliament.

PRESUMPTION, in Scots law See LAW, Tit. xxxi. 18.

PRETERITE TENSE, in grammar. See GRAMMAR.

PRETEXT, a colour or motive, whether real or feigned, for doing ſomething.

Toga PRETEXTA, among the ancient Romans, a long white gown, with a border of purple round the edges, and worn by children of quality till the age of puberty, *viz.* by the boys till ſeventeen, when they changed it for the toga virilis; and by the girls till marriage.

PRETOR, a magiſtrate among the ancient Romans, not unlike our lord chief juſtices, or lord chancellor, or both in one; as being veſted with the power of diſtributing juſtice among the citizens. At firſt there was only one pretor; but afterwards another being created, the firſt or chief one had the title of pretor urbanus, or the city-pretor; the other was called peregrinus, as being judge in all matters relating to foreigners. But, beſides theſe, there were afterwards created many provincial pretors; who were not only judges, but alſo aſſiſted the conſuls in the government of the provinces, and even were inveſted with the government of provinces themſelves.

PRETORIAN GUARDS, in Roman antiquity, were the emperor's guards, who at length were increaſed to ten thouſand: they had this denomination, according to ſome, from their being ſtationed at a place in the palace called prætorium: their commander was ſtiled prætectus prætorii. See PREFECT.

PRETORIUM, among the Romans, denoted the hall or court wherein the pretor lived, and wherein he adminiſtered juſtice.

PREVENTION *in Juriſdiction*, in Scots law. See LAW, Tit. ii. 5.

PRIAPISM, in medicine, a continual and painful erection of the penis.

PRIAPUS in medicine, denotes the genital parts in men

It alſo denotes in antiquity, a fabulous deity, particularly adored at Lamſpacus, the place of his birth, who was revered very much for the extraordinary ſize of his parts.

PRIEST, a perſon ſet apart for the performing of ſacrifice and other offices of religion.

PRIEST, in the Chriſtian church, is a perſon inveſted with holy orders; in virtue whereof he has a power to preach, pray, adminiſter the ſacraments, *&c.*

PRIMÆ VIÆ, among phyſicians, denote the whole alimentary duct; including the œſophagus, ſtomach, and inteſtines, with their appendages.

PRIMAGE, in commerce, a ſmall duty at the water ſide, uſually about twelve pence per tun, or ſix pence a bale, due to the maſter and mariners of a ſhip.

PRIMATE, in church-polity, an archbiſhop, who is inveſted with a juriſdiction over other biſhops.

PRIME, an appellation given to whatever is firſt in order, degree, or dignity, among ſeveral things of the ſame or like kind; thus we ſay the prime miniſter, prime coſt, *&c.*

PRIMIPILUS, in antiquity, the centurion of the firſt cohort of a legion, who had charge of the Roman eagle.

PRIMITIÆ, the firſt fruits gathered of the earth, whereof the ancients made preſents to the gods.

PRIMITIVE, in grammar, is a root or original word in a language, in contradiſtinction to derivative: thus, *God* is a primitive, *godly* a derivative, and *god-like* a compound.

PRIMULA, in botany, a genus of the pentandria monogynia claſs. The tube of the corolla is cylindrical, with an open mouth. There are eight ſpecies, three of them natives of Britain, *viz.* the vulgaris, or common primroſe; the veris, or cows-lips; and the farinoſa, or birds-eye.

PRINCE, in polity, a perſon inveſted with the ſupreme command of a ſtate, independent of any other.

Prince alſo denotes a perſon who is a ſovereign in his own territories, yet holds of ſome other as his ſuperior; ſuch are the princes of Germany.

PRINCIPAL, the chief and moſt neceſſary part of a thing.

PRINCIPATE, a province of the kingdom of Naples, ſituated on the Mediterranean, between the provinces of Lavoro and Calabria: and divided into the Hither and Further Principate, with reſpect to the city of Naples

PRINCIPLE, in general, is uſed for the cauſe, ſource, or origin of any thing.

PRINCIPLE, is alſo ſometimes uſed in a ſynonymous ſenſe with axiom or maxim.

PRINOS, in botany, a genus of the hexandria monogynia claſs. The calix conſiſts of ſix ſegments. and the corolla of one rotated petal; and the berry contains ſix ſeeds. There are two ſpecies, both natives of America.

PRINT, the impreſſion taken from a copperplate. See *Rolling preſs* PRINTING.

PRINTER, a perſon who compoſes and takes impreſſions from moveable characters ranged in order, or from plates engraven, by means of ink, and a preſs. or from blocks of wood cut in flowers, *&c* and taken off in various colours on calicoes, linens, ſilks, *&c.*

The moſt curious of theſe arts, and that which deſerves the moſt particular explication, is the firſt; for to the printers of books are chiefly owing our deliverance from ignorance and error, the progreſs of learning, the revival of the ſciences, and numberleſs improvements in arts, which, without this noble invention, would have been either loſt to mankind, or confined to the knowledge of a few. The firſt printers were Guttemberg, Fuſt, Schoeffer, Mentel, and Koſter; and the firſt who practiſed this art in England was Fred. Corſeilles, who brought it over from Haerlem, in the reign of king Henry VI. The great printers famous for the correctneſs and elegance of their works, were Aldus, and Paulus Manutius; the two Badii; William and Frederic Morel; Oporin; Frobenius; Robert, Henry, and Charles Stephens; Gryphius, Turnebus, Torres, Commelin, Plantin, Raphelengius, Vaſcoſan, Bleau, Criſpin, and the two Elzevirs; and among theſe, the learned printers were the Manutii, the Stephenſes, the Bodii, Turnebus, Morel, *&c.* Plantin had the title of architypographus, or arch-printer, given him.

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him by the king of Spain in conſideration of his printing the polyglot of Antwerp. The printers of Germany, *&c.* generally caſt their own letter, and ſell their own books These are in many places ranked among the members of univerſities, and entitled to the privilege of ſtudents. In England, they are eſteemed a part of the company of ſtationers and bookſellers.

PRINTING, the art of taking impreſſions from characters or figures, moveable or immoveable, on paper, linen, ſilk, *&c.* There are three kinds of printing; the one from moveable letters, for books; another from copper-plates, for pictures; and the laſt from blocks, in which the repreſentation of birds, flowers, *&c.* are cut, for printing calicoes, linens, *&c.* the firſt called common-preſs printing, the ſecond rolling-preſs printing, and the laſt calico, *&c.* printing. The principal difference between the three conſiſts in this, that the firſt is caſt in relievo, in diſtinct pieces; the ſecond engraven in creux; and the third cut in relievo, and generally ſtamped, by placing the block upon the materials to be printed, and ſtriking upon the back of it.

Progreſs of PRINTING. Who the firſt inventors of the European method of printing books were, in what city and what year it was ſet on foot, are queſtions long diſputed among the learned. In effect, as the Grecian cities contended for the birth of Homer, ſo do the German cities for that of printing. Mentz, Haerlem, and Straſburg, are the warmeſt on this point of honour. John Guttemburg, and John Fuſt of Mentz; John Mentel of Straſburg, and Ln. John Koſter of Haerlem; are the perſons to whom this honour is ſeverally aſcribed, by their reſpective countrymen; and they have all their advocates among the learned. However, their firſt eſſays were made on wooden blocks, after the Chineſe manner. The book at Haerlem, the vocabulary called Catholicon, and the pieces in the Bodleian library, and that of Bennet-college, are all performed in this way; and the impreſſion appears to have been only given on one ſide of the leaves, after which the two blank ſides were paſted together. But they ſoon found the inconveniences of this method; and therefore bethought themſelves of an improvement; which was by making ſingle letters diſtinct from one another; and theſe being firſt done in wood, gave room for a ſecond improvement, which was the making them of metal; and, in order to that, forming moulds, matrices, *&c.* for caſting them.

From this ingenious contrivance we ought to date the origin of the preſent art of printing, contradiſtinguiſhed from the method practiſed by the Chineſe. And of this Schoeffer, or Scheffer, firſt ſervant, and afterwards partner and ſon-in-law of Fuſt, at Mentz, abovementioned, is pretty generally allowed to be the inventor, ſo that he may properly be reckoned the firſt printer, and the Bible which was printed with moveable letters in 1450, the firſt printed book; the next was Auguſtine de civitate Dei, then Tully's offices, printed about the year 1461. In theſe books they left the places of the initial letters blank, and gave them to the illuminers to have them ornamented and painted in gold and azure, in order to render the work more beautiful, and, as ſome think, to make their books paſs for manuſcripts.

Some authors tell us, that Fuſt carrying a parcel of bibles with him to Paris, and offering them to ſale as manuſcripts; the French, upon conſidering the number of books, and their exact conformity to each other even to a point, and that it was impoſſible for the beſt book-writers to be ſo exact, concluded there was witchcraft in the caſe, and, by their actually indicting him as a conjurer, or threatening to do ſo, extorted from him the ſecret: and hence the origin of the popular ſtory of Dr. Fauſtus.

From Mentz, the art of printing ſoon ſpread itſelf throughout a good part of Europe: Haerlem and Straſburg had it very early; which, as the current of authors repreſent it, occaſioned their pretending to the honour of the invention. From Haerlem it paſſed to Rome in 1467; and into England in 1468, by means of Tho. Bourchier, archbiſhop of Canterbury, who ſent W. Turner maſter of the robes, and W. Caxton merchant, to Haerlem to learn the art. Theſe privately prevailing with Corſeilles, an under-workman, to come over, a preſs was ſet up at Oxford, and an edition of Ruffinus on the creed was printed the ſame year in octavo. From Oxford Caxton brought it to London about the year 1470, and the ſame year it was carried to Paris. Hitherto there had been nothing printed but in Latin, and the vulgar tongues; and this firſt in Roman characters, then in Gothic, and at laſt in Italic: but in 1480, the Italians caſt a ſet of Greek types; and they have alſo the honour of the firſt Hebrew editions, which were printed about the ſame time with the Greek. Towards the end of the ſixteenth century there appeared various editions of books in Syriac, Arabic, Perſian, Armenian, Coptic or Egyptian characters; ſome to gratify the curioſity of the learned, and others for the uſe of the Chriſtians of the Levant. Out of Europe, the art of printing has been carried into the three other parts of the world: for Aſia, we ſee impreſſions of books at Goa, and in the Philippines; at Morocco, for Africa; at Mexico, Lima, Philadelphia, New York, Boſton, *&c.* for America. The Turks, indeed, rigorouſly prohibit printing throughout their empire, as imagining that the too frequent communication with books might occaſion ſome change in their religion and government; yet the Jews have ſeveral editions of their books printed at Theſſalonia, and even at Conſtantinople.

Method of PRINTING. The workmen employed in the art of printing are of two kinds: compoſitors, who range and diſpoſe the letters into words, lines, pages, *&c.* according to the copy delivered them by the author; and preſſmen, who apply ink upon the ſame, and take off the impreſſion. The types being caſt, the compoſitor diſtributes each-kind by itſelf among the diviſions of two wooden frames, an upper and an under one, called caſes; each of which is divided into little cells or boxes. Thoſe of the upper caſe are in number ninety-eight: theſe are all of the ſame ſize; and in them are diſpoſed the capitals, ſmall capitals, accented letters, figures, *&c.* the capitals being placed in alphabetical order. In the cells of the lower caſe, which are fifty-four, are placed the ſmall letters, with the points, ſpaces. *&c.* The boxes are here of different ſizes, the largeſt being for the letters moſt uſed; and theſe boxes are not in alphabetical order, but the cells which contain the letter oftenеſt wanted are neareſt the compoſitor's hand. Each caſe is placed a little aſlope, that the compoſitor may the more eaſily reach the upper boxes. The inſtrument in which the letter are ſet is called a compoſing-ſtick, (*ibid.* n° 2) which conſiſts

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conſiſts of a long and narrow plate of braſs, or iron, *&c.* *c c*; on the right-ſide of which ariſes a ledge *b b*, which runs the whole length of the plate, and ſerves to ſuſtain the letters, the ſides of which are to reſt againſt it: along this ledge is a row of holes, which ſerve for introducing the ſcrew *f*, in order to lengthen or ſhorten the extent of the line, by moving the ſliders *e d* farther from or nearer to the ſhorter ledge at the end *a*. Where marginal notes are required in a work, the two ſliding-pieces *e d* are opened to a proper diſtance from each other, in ſuch a manner as that while the diſtance between *d* and *c* forms the length of the line in the text, the diſtance between the two ſliding-pieces forms the length of the lines for the notes on the ſide of the page. Before the compoſitor proceeds to compoſe, he puts a rule, or thin ſlip of braſs-plate, cut to the length of the line, and of the ſame height as the letter, in the compoſing-ſtick, againſt the ledge, for the letter to bear againſt. Things thus prepared, the compoſitor having the copy lying before him, and his ſtick in his left-hand, his thumb being over the ſlider *d*; with the right, he takes up the letters, ſpaces, *&c.* one by one, and places them againſt the rule, while he ſupports them with his left thumb by preſſing them to the end of the ſlider *d*, the other hand being conſtantly employed in ſetting in other letters: the whole being performed with a degree of expedition and addreſs not eaſy to be imagined.

A little being thus compoſed, if it end with a word or ſyllable, and exactly fill the meaſure, there needs no further care; otherwiſe, more ſpaces are to be put in, or elſe the diſtances leſſened between the ſeveral words, in order to make the meaſure quite full, ſo that every line may end even. The ſpaces here uſed are pieces of metal exactly ſhaped like the ſhanks of the letters: theſe are of various thickneſſes, and ſerve to ſupport the letters, and to preſerve a proper diſtance between the words; but not reaching ſo high as the letters, they make no impreſſion when the work is printed. The firſt line being thus finiſhed, the compoſitor proceeds to the next; in order to which he moves the braſs-rule from behind the former, and places it before it, and thus compoſes another line againſt it after the ſame manner as before; going on thus till his ſtick is full, when he empties all the lines contained in it into the gally.

The compoſitor then fills and empties his compoſing-ſtick as before, till a complete page be formed; when he ties it up with a cord or pack-thread, and ſetting it by, proceeds to the next, till the number of pages to be contained in a ſheet is completed; which done, he carries them to the impoſing-ſtone, there to be ranged in order, and faſtened together in a frame called a chaſe, and this is termed impoſing. The chaſe is a rectangular iron-frame, of different dimenſions, according to the ſize of the paper to be printed, having two croſs-pieces of the ſame metal, called a long and ſhort croſs, mortiſed at each end ſo as to be taken out occaſionally By the different ſituation of theſe croſſes the chaſe is fitted for different volumes: for quartos and octavos, one traverſes the middle lengthwiſe, the other broadwiſe, ſo as to interſect each other in the centre: for twelves and twenty-fours, the ſhort croſs is ſhifted nearer to one end of the chaſe: for folios, the long croſs is left entirely out, and the ſhort one left in the middle; and for broad-ſides, both croſſes are ſet aſide. To dreſs the chaſe, or range and fix the pages therein, the compoſitor makes uſe of a ſet of furniture, conſiſting of ſlips of wood of different dimenſions, and about half an inch high, that they may be lower than the letters: ſome of theſe are placed at the top of the pages, and called head-ſticks; others between them, to form the inner margin; others on the ſides of the croſſes, to form the outer margin, where the paper is to be doubled; and others in the form of wedges to the ſides and bottom of the pages. Thus all the pages being placed at their proper diſtances, and ſecured from being injured by the chaſe and furniture placed about them, they are all untied, and faſtened together by driving ſmall pieces of wood called quoins, cut in the wedge-form, up between the ſlanting ſide of the foot and ſide ſticks and the chaſe, by means of a piece of hard wood and a mallet; and all being thus bound faſt together, ſo that none of the letters will fall out, it is ready to be committed to the the preſſman. In this condition the work is called a form; and as there are two of theſe forms required for every ſheet, when both ſides are to be printed, it is neceſſary the diſtances between the pages in each form ſhould be placed with ſuch exactneſs, that the impreſſion of the pages in one form ſhall fall exactly on the back of the pages of the other, which is called regiſter.

As it is impoſſible but that there muſt be ſome miſtakes in the work, either through the overſight of the compoſitor, or by the caſual tranſpoſition of letters in the caſes; a ſheet is printed off, which is called a proof, and given to the corrector; who reading it over, and rectifying it by the copy, by making the alterations in the margin, it is delivered back to the compoſitor to be corrected.

The compoſitor then unlocking the form upon the correcting-ſtone, by looſening the quoins or wedges which bound the letters together, rectifies the miſtakes by picking out the faulty or wrong letters with a ſlender ſharp-pointed ſteel-bodkin, and puts others into their places. After this another proof is made, ſent to the author, and corrected as before; and laſtly, there is another proof, called a reviſe, which is made in order to ſee whether all the miſtakes marked in the laſt proof are corrected.

The preſſman's buſineſs is to work off the forms thus prepared and corrected by the compoſitor; in doing which there are four things required, paper, ink, balls, and a preſs. To prepare the paper for uſe, it is to be firſt wetted by dipping ſeveral ſheets together in water: theſe are afterwards laid in a heap over each other; and to make them take the water equally, they are all preſſed cloſe down with a weight at the top. The ink is made of oil and lamp-black; for the manner of preparing which, ſee *Printing* INK. The balls, by which the ink is applied on the forms, are a kind of wooden funnels with handles, the cavities of which are filled with wool or hair, as is alſo a piece of alum-leather or pelt nailed over the cavity, and made extremely ſoft by ſoaking in urine, and by being well rubbed. One of theſe the preſſman takes in each hand; and applying one of them to the ink-block, daubs and works them together to diſtribute the ink equally, and then blackens the form which is placed on the preſs, by beating with the balls upon the face of the letter.

The printing-preſs repreſented in Plate CXLVII. fig. 1.

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n° 1. is a very curious, though complex machine. The body conſiſts of two ſtrong cheeks, *a a*, placed perpendicularly, and joined together by four croſs-pieces; the cap *b*; the head *c*, which is moveable, being partly ſuſtained by two iron-pins, or long bolts, that paſs the cap; the ſhelves *d d*, which ſerve to keep ſteady a part called the hoſe; and the winter *e*, which bears the carriage, and ſuſtains the effort of the preſs beneath. The ſpindle *f* is an upright piece of iron pointed with ſteel, having a male-ſcrew which goes into the female one in the head about four inches. Through the eye *g* of this ſpindle is faſtened the bar *k*, by which the preſſman makes the impreſſion. Part of the ſpindle is incloſed in a ſquare wooden frame called the hoſe *h*, and its point works into a braſs-pan ſupplied with oil, which is fixed to an iron-plate let into the top of the platten. At each corner of the hoſe, there is an iron-hook faſtened with pack-thread to thoſe at each end of the platten *i*, in ſuch a manner as to keep it perfectly level. The carriage *l l* is placed a foot below the platten, having its fore-part ſupported by a prop called the fore-ſtay, while the other reſts on the winter. On this carriage, which ſuſtains the plank, are nailed two long iron-bars or ribs, and on the plank are nailed ſhort pieces of iron or ſteel called cramp-irons, equally tempered with the ribs, and which ſlide upon them when the plank is turned in or out. Under the carriage is fixed a long piece of iron called the ſpit, with a double wheel in the middle, round which leather-girts are faſtened, nailed to each end of the plank; and to the outſide of the ſpit is fixed a rounce *m*, or handle to turn round the wheel. Upon the plank is a ſquare frame or coffin, in which is incloſed a poliſhed ſtone on which the form *n* is laid; at the end of the coffin are three frames, *viz.* the two tympans and friſket: the tympans *o* are ſquare, and made of three ſlips of very thin wood, and at the top a piece of iron ſtill thinner; that called the outer tympan is faſtened with hinges to the coffin: they are both covered with parchment; and between the two are placed blankets, which are neceſſary to take off the impreſſion of the letters upon the paper. The friſket *p* is a ſquare frame of thin iron, faſtened with hinges to the tympan; it is covered with paper cut in the neceſſary places, that the ſheet, which is put between the friſket and the great or outward tympan, may receive the ink, and that nothing may hurt the margins. To regulate the margins, a ſheet of paper is faſtened upon this tympan, which is called the tympan-ſheet; and on each ſide is fixed an iron point, which makes two holes in the ſheet, which is to be placed on the ſame points, when the impreſſion is to be made on the other ſide. In preparing the preſs for working, the parchment which covers the outer tympan is wetted till it is very ſoft, in order to render the impreſſion more equable; the blankets are then put in, and ſecured from ſlipping by the inner tympan: then while one preſſman is beating the letter with the balls *q*, covered with ink taken from the ink-block, the other perſon places a ſheet of white paper on the tympan-ſheet, turns down the friſket upon it to keep the paper clean and prevent its ſlipping; then bringing the tympans upon the form, and turning the rounce, he brings the form with the ſtone, *&c.* weighing about 300 pounds weight, under the platten; pulls with the bar, by which means the platten preſſes the blankets and paper cloſe upon the letter, whereby half the form is printed; then eaſing the bar, he draws the form ſtill forward, gives a ſecond pull, and letting go the bar, turns back the form, takes up the tympans and friſket, takes out the printed ſheet, and lays on a freſh one; and this is repeated till he has taken off the impreſſion upon the full number of ſheets the edition is to conſiſt of. One ſide of the ſheet being thus printed, the form for the other is laid upon the preſs, and worked off in the ſame manner.

Chineſe PRINTING, is performed from wooden planks or blocks, cut like thoſe uſed in printing of callico, paper, cards, *&c.*

Rolling-preſs PRINTING, is employed in taking off prints or impreſſions from copper-plates engraven, etched, or ſcraped as in mezzotintos. See ENGRAVING.

This art is ſaid to have been as ancient as the year 1540, and to owe its origin to Finiguerra, a Florentine goldſmith, who pouring ſome melted brimſtone on an engraven plate, found the exact impreſſion of the engraving left in the cold brimſtone, marked with black taken out of the ſtrokes by the liquid ſulphur: upon this he attempted to do the ſame on ſilver-plates with wet paper, by rolling it ſmoothly with a roller; and this ſucceeded: but this art was not uſed in England till the reign of king James I. when it was brought from Antwerp by Speed. The form of the rolling-preſs, the compoſition of the ink uſed therein, and the manner of applying both in taking off prints, are as follow.

The rolling-preſs AL (Plate CXLVII. fig. 2.) may be divided into two parts, the body and carriage: the body conſiſts of two wooden cheeks PP placed perpendicularly on a ſtand or foot LM, which ſuſtains the whole preſs. From the foot likewiſe are four other perpendicular pieces *c,c,c,c*, joined by other croſs or horizontal ones *d,d,d*, which ſerve to ſuſtain a ſmooth even plank or table HIK, about four feet and a half long, two feet and a half broad, and an inch and a half thick. Into the cheeks go two wooden cylinders or rollers, DE, FG, about ſix inches in diameter, borne up at each end by the cheeks, whoſe ends, which are leſſened to about two inches diameter, and called trunnions, turn in the cheeks about two pieces of wood in form of half-moons, lined with poliſhed iron to facilitate the motion. Laſtly, to one of the trunnions of the upper roller is faſtened a croſs, conſiſting of two levers A,B, or pieces of wood, traverſing each other, the arms of which croſs ſerve inſtead of the bar or handle of the letter-preſs, by turning the upper roller, and when the plank is between the two rollers, giving the ſame motion to the under one, by drawing the plank forward and backward.

The ink uſed for copper-plates, is a compoſition made of the ſtones of peaches and apricots, the bones of ſheep, and ivory, all well burnt, and called Frankfort black, mixt with nut-oil that has been well boiled, and ground together on a marble, after the ſame manner as painters do their colours.

The method of printing from copper-plates is as follows. They take a ſmall quantity of this ink on a rubber made of linen-rags ſtrongly bound about each other, and therewith ſmear the whole face of the plate as it lies on a grate over a charcoal-fire. The plate being ſufficiently inked, they firſt wipe it over with a coarſe rag, then with the

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Fig. 1 Printing Press.

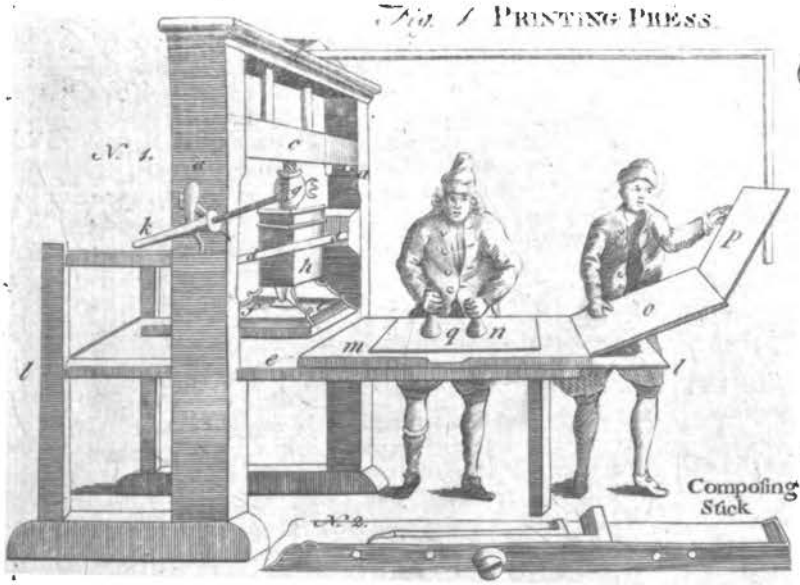

Fig. 2. Rolling Press.

Fig. 3. Purpure.

4. Quartering.

5. Raguled.

6. Rampant.

7. Rayonant.

8. Remply.

9. Resarcelee.

10. Ribban.

11. Rompee.

12. Rustre.

13. Sable.

14. Saliant.

15. Saltier.

16. Scarp.

17. Surmounted.

18. Tenne.

19. Traverse.

20. Tresure.

21. Vair.

22. Vairy Cuppy.

23. Vert.

24. Voider.

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the palm of their left hand, and then with that of the right; and to dry the hand and forward the wiping, they rub it from time time in whiting. In wiping the plate perfectly clean, yet without taking the ink out of the engraving, the addreſs of the workman conſiſts. The plate thus prepared, is laid on the plank of the preſs; over the plate is laid the paper, firſt well moiſtened, to receive the impreſſion, and over the paper two or three folds of flannel. Things thus diſpoſed, the arms of the croſs are pulled and by that means the plate with its furniture paſſed through between the rollers, which pinching very ſtrongly, yet equally, preſſes the moiſtened paper into the ſtrokes of the engraving, whence it licks out the ink.

PRIOR, the ſuperior of a convent of monks, or the next under the abbot. See ABBOT.

PRISCILLIANISTS, in church-hiſtory, Chriſtian heretics, ſo called from their leader Priſcillian, a Spaniard by birth, and biſhop of Avila. He is ſaid to have practiſed magic, and to have maintained the principal errors of the Manichees; but his peculiar tenet was, that it is lawful to make falſe oaths, in order to ſupport one's cauſe and intereſt.

PRISM, an oblong ſolid, contained under more than four planes whoſe baſes are equal, parallel, and alike ſituated.

PRIVATEERS, in maritime affairs, a kind of private ſhips of war, fitted out by private perſons at their own expence; who have leave granted them to keep what they can take from the enemy, allowing the admiral his ſhare. See LETTER *of Marque*.

PRIVATION, in general, denotes the abſence or want of ſomething; in which ſenſe, darkneſs is only a privation of light.

PRIVATIVE, in grammar, a particle which, when preſixed to a word, changes it into a contrary ſenſe. See GRAMMAR.

PRIVET, in botany. See LIGUSTRUM.

PRIVILEGE, in law, ſome peculiar benefit granted to certain perſons or places, contrary to the uſual courſe of the law.

Privileges are ſaid to be perſonal or real. Perſonal privileges are ſuch as are extended to peers, embaſſadors, members of parliament and of the convocation, and their menial ſervants, &c. See PEER, EMBASSADOR, PARLIAMENT, &c.

PRIVILEGED DEBTS, in Scots law. See LAW, Tit. xxviii. 19.

PRIVY-COUNCIL. See *Privy*-COUNCIL.

PRIVY SEAL. See SEAL.

PRIZE, in maritime affairs, a veſſel taken at ſea from the enemies of a ſtate, or from pirates; and that either by a man of war, a privateer, &c. having a commiſſion for that purpoſe.

PROBABILITY, is nothing but the appearance of the agreement or diſagreement of two ideas by the intervention of proofs whoſe connection is not conſtant and immutable, or is not perceived to be ſo; but is, or appears for the moſt part to be ſo; and is enough to induce the mind to judge the propoſition to be true or falſe, rather than the contrary. See LOGIC and METAPHYSICS.

PROBATE of a will or teſtament, in law, is the exhibiting and proving of laſt wills and teſtaments before the eccleſiaſtical judge delegated by the biſhop who is ordinary of the place where the party died.

PROBATION, in the univerſities, is the examination and trial of a ſtudent who is about to take his degrees.

PROBATION, in Scots law. See LAW, Tit. xxxi. 1, *et ſeq.*

PROBATIONER, in the church of Scotland, a ſtudent in divinity, who bringing a certificate from a profeſſor in an univerſity of his good morals, and his having performed his exerciſes to approbation, is admitted to undergo ſeveral trials.

PROBE, a ſurgeon's inſtrument for examining the circumſtances of wounds, ulcers, and other cavities, ſearching for ſtones in the bladder, &c.

PROBLEM, in logic, a propoſition that neither appears abſolutely true nor falſe; and, conſequently, may be aſſerted either in the affirmative or negative.

PROBLEM, in geometry, is a propoſition, wherein ſome operation or conſtruction is required; as to divide a line or angle, erect or let fall perpendiculars, &c. See GEOMETRY.

PROBOSCIS, in natural hiſtory, is the trunk or ſnout of an elephant, and ſome other animals and inſects.

PROCATARCTIC CAUSE, in medicine, the pre-exiſting, or pre-diſpoſing cauſe or occaſion of a diſeaſe.

PROCELEUSMATICUS, in the ancient poetry, a foot conſiſting of four ſhort ſyllables, or two pyrrhichiuſes; as, *hominibus*,

PROCELLARIA, in ornithology, a genus of birds, belonging to the order of anſeres. The beak is ſomewhat compreſſed, and without teeth; the mandibles are equal, the ſuperior one being crooked at the point; the feet are palmated, the hind-claw being ſeſſil, without any toe. There are ſix ſpecies, principally diſtinguiſhed by their colour.

PROCESS, in law, denotes the proceedings in any cauſe, real or perſonal, civil or criminal, from the original writ to the end thereof.

PROCESS, in chemiſtry, the whole courſe of an experiment or ſeries of operations, tending to produce ſomething new.

PROCESS, in anatomy, denotes any protuberance or eminence in a bone.

PROCESSION, a ceremony in the Romiſh church, conſiſting of a formal march of the clergy and people, putting up prayers, &c. and in this manner viſiting ſome church, &c. They have alſo proceſſions of the hoſt or ſacrament. See HOST.

PROCLAMATION, a public notice given of any thing of which the king thinks proper to advertiſe his ſubjects.

Proclamations are a branch of the king's prerogative; and no perſon can make them without the king's authority, except mayors of towns, &c. by cuſtom of privilege. Proclamations which require the people to do or not to do certain things, have the force of laws; but then they are ſuppoſed to be conſiſtent with the laws already in being, otherwiſe they are ſuperſeded.

PROCONSUL, a Roman magiſtrate, ſent to govern a province with conſular authority.

PROCREATION, the begetting and bringing forth children. See GENERATION and MIDWIFERY.

PROCTOR, a perſon commiſſioned to manage another perſon's cauſe in any court of the civil or eccleſiaſtical law.

PROCURATION, an act or inſtrument by which a perſon

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is impowered to treat, tranſact, receive, &c. in another perſon's name.

PROCURATOR, a perſon who has a charge committed to him to act for another.

PROCYON, in aſtronomy. See ASTRONOMY, p. 487.

PRODUCT, in arithmetic. See ARITHMETIC, p. 371.

PROFANATION, the acting diſreſpectfully to ſacred things.

PROFANE, a term uſed in oppoſition to holy; and, in general, is applied to all perſons who have not the ſacred character, and to things which do not belong to the ſervice of religion.

PROFESSION, among the Romaniſts, denotes the entering into a religious order, whereby a perſon offers himſelf to God by a vow of inviolably obſerving obedience, chaſtity, and poverty.

PROFESSOR, in the univerſities, a perſon who teaches or reads public lectures in ſome art or ſcience from a chair for the purpoſe.

PROFILE, in architecture, the draught of a building, fortification, &c. wherein are expreſſed the ſeveral neights, widths, and thickneſſes, ſuch as they would appear were the building cut down perpendicularly from the roof to the foundation.

PROFLUVIUM, in medicine, denotes a flux, or liquid evacuation, of any thing.

PROGNOSTICS, among phyſicians, ſignifies a judgment concerning the event of a diſeaſe; as, whether it ſhall end in life or death, be ſhort or long, mild or malignant, &c.

PROGRESSION, in general, denotes a regular advancing, or going forward in the ſame courſe and manner. See ARITHMETIC, ALGEBRA, and GEOMETRY.

PROJECTION, in mechanics, the act of communicating motion to a body, from thence called projectile. See MECHANICS.

PROJECTURE, in architecture, the out-jetting, prominency, or emboſſing, which the mouldings and other members have beyond the naked wall, column, &c. See ARCHITECTURE.

PROLAPSUS, in ſurgery, a prolapſion, or falling out of any part of the body from its natural ſituation; thus we ſay prolapſus inteſtini, a prolapſion of the inteſtine, &c. See SURGERY.

PROLATE, in geometry, an epithet applied to a ſpheroid produced by the revolution of a ſemi-ellipſis about its larger diameter.

PROLEGOMENA, certain preparatory obſervations or diſcourſes prefixed to a book, &c. containing ſomething neceſſary for the reader to be appriſed of, to enable him the better to underſtand the book, or to enter deeper into the ſcience, &c.

PROLEPSIS, a figure in rhetoric, by which we anticipate or prevent what might be objected by the adverſary.

PROLEPTIC, an epithet applied to a periodical diſeaſe which anticipates, or whoſe paroxyſm returns ſooner and ſooner every time, as is frequently the caſe in agues.

PROLIFIC, ſomething that has the qualities neceſſary for generating.

PROLIXITY, in diſcourſe, the fault of entering into too minute a detail, of being too long, preciſe, and circumſtantial, even to a degree of tedioufneſs.

PROLOGUE, in dramatic poetry, a diſcourſe addreſſed to the audience before the drama or play begins. The original intention was to advertiſe the audience of the ſubject of the piece, and to prepare them to enter more eaſily into the action, and ſometimes to make an apology for the poet.

PROMETHEUS, in the ancient aſtronomy, the name of the conſtellation now called Hercules. See ASTRONOMY, p. 487.

PROMISE, in law, is when upon any valuable conſideration one binds himſelf by word of mouth to another to perform a thing agreed on.

PROMONTORY, in geography, a high point of land or rock projecting out into the ſea; the extremity of which towards the ſea, is called a cape, or headland.

PROMULGATED, ſomething publiſhed or proclaimed, and generally applied to a law, to denote the publiſhing or proclaiming to the people.

PRONATION. See ANATOMY, p. 179.

PRONATORS, in anatomy. See ANATOMY, p. 198.

PRONOUN, in grammar, a declinable part of ſpeech, which being put inſtead of a noun, points out ſome perſon or thing. See GRAMMAR.

PRONUNCIATION, in grammar, the manner of articulating or ſounding the words of a language. See GRAMMAR.

PROOF, in law, &c. denotes the mediums or arguments uſed to evince the truth of any thing.

PROPAGATION, the act of multiplying the kind. See GENERATION.

PROPER, ſomething naturally and eſſentially belonging to any thing.

PROPERTY, in a general ſenſe, that which conſtitutes or denominates a thing proper; or it is a particular virtue or quality which nature has beſtowed on ſome things excluſive of all others: thus colour is a property of light; extenſion, figure, diviſibility, and impenetrability, are properties of body.

PROPERTY, in law, is deſcribed to be the higheſt right a perſon has, or can have, to any thing.

PROPHECY, a prediction made by divine inſpiration.

PROPHET, in general, a perſon who foretels future events; but is particularly applied to ſuch inſpired perſons among the Jews as were commiſſioned by God to declare his will and purpoſes to that people. Among the canonical books of the Old Teſtament, we have the writings of ſixteen prophets, four of which are denominated the greater prophets, *viz.* Iſaiah, Jeremiah, Ezekiel, and Daniel, ſo called from the length or extent of their writings, which exceed thoſe of the others, *viz* Hoſea, Joel, Amos, Obadiah, Jonah, Micah, Nahum, Habakkuk, Zephaniah, Haggai, Zechariah, and Malachi, who are called the leſſer prophets from the ſhortneſs of their writings. The Jews do not place Daniel among the prophets, becauſe, they ſay, he lived the life of a courtier rather than that of a prophet.

PROPITIATION, in theology, a ſacrifice offered to God to aſſwage his wrath, and render him propitious. Among the Jews there were both ordinary and public ſacrifices as holocauſts, &c. offered by way of thankſgiving; and extraordinary ones, offered by particular perſons guilty of any crime, by way of propitiation. The Romiſh church believe the maſs to be a ſacrifice of propitiation for the living and the dead. The reformed churches allow of

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of no propitiation but that one offered by Jeſus Chriſt on the croſs.

PROPOLIS, the name of a certain ſubſtance more glutinous and tenaceous than wax, with which the bees ſtop up all the holes or cracks in the ſides of their hives. See APIS.

PROPONTIS, or *Sea of* MARMORA, divides Europe from Aſia; having the Boſphorus on the north-eaſt, by which it has a communication with the Euxine ſea; and the Helleſpont on the ſouth-weſt, by which it communicates with the Archipelago. It is one hundred and twenty miles long, and in ſome places upwards of forty broad.

PROPORTION. When two quantities are compared one with another, in reſpect of their greatneſs or ſmallneſs, the compariſon is called ratio, rate, or proportion. See ALGEBRA, ARITHMETIC, and GEOMETRY.

PROPOSITION, in logic, part of an argument wherein ſome quality, either negative or poſitive, is attributed to a ſubject. See LOGIC.

PROPOSITION, in mathematics, is either ſome truth advanced, and ſhewn to be ſuch by demonſtration; or ſome operation propoſed, and its ſolution ſhewn.

PROPREFECT, among the Romans, the prefect's lieutenant, or an officer whom the prefect of the pretorium commiſſioned to do any part of his duty in his place.

PROPRETOR, a Roman magiſtrate, who, having diſcharged the office of pretor at home, was ſent into a province to command there with his former pretorial authority.

PROROGATION, the act of prolonging, adjourning, or putting off to another time. The difference between a prorogation and an adjournment of parliament is, that by prorogation the ſeſſion is ended, as ſuch bills as paſſed in either houſe, or both houſes, and had not the royal aſſent, muſt at the next aſſembly begin again.

PROSCRIPTION, a publication made in the name of the chief or leader of a party, whereby he promiſes a reward to any one who ſhall bring him the head of one of his enemies.

PROSE, the natural language of mankind, looſe, and unconfined by poetical meaſures, rhymes, *&c.* in which ſenſe it ſtands oppoſed to verſe.

PROSECUTOR, in law, he that purſues a cauſe in another's name.

PROSELYTE, a new convert to ſome religion or religious ſect.

PROSPERPINACA, in botany, a genus of the triandria trigynia claſs. The calix conſiſts of three ſegments; it has no corolla, and but one ſeed. There is only one ſpecies, a native of Virginia.

PROSODY, that part of grammar which treats of the quantities and accents of ſyllables. See GRAMMAR.

PROSOPOPOEIA, a figure in rhetoric, whereby we raiſe qualities of things inanimate into perſons.

PROSTATÆ, in anatomy. See ANATOMY, p. 273.

PROSTYLE, in architecture, a range of columns in the front of a temple.

PROTEA, in botany, a genus of the tetrandria monogynia claſs. The petal conſiſts of four ſegments ſurrounding the germen; it has no proper calix; and the receptacle is paleaceous. There are two ſpecies, both natives of the Cape of Good Hope.

PROTECTOR, a perſon who undertakes to ſhelter and defend the weak, helpleſs, and diſtreſſed.

PROTESTANT, a name firſt given in Germany to thoſe who adhered to the doctrine of Luther; becauſe, in 1529, they proteſted againſt a decree of the emperor Charles V. and the diet Spires; declaring that they appealed to a general council. The ſame name has alſo been given to thoſe of the ſentiments of Calvin, and is now become a common denomination for all thoſe of the reformed churches.

PROTHONOTARY, a term which properly ſignifies firſt notary, and which was anciently the title of the principal notaries of the emperors of Conſtantinople.

PROTOTYPE, is the original or model after which a thing was formed; but chiefly uſed for the patterns of things to be engraved, caſt, *&c.*

PROTRACTOR, the name of an inſtrument uſed for protracting or laying down on paper the angles of a field, or other figure. See GEOMETRY.

PROTUBERANCE, is an eminence, whether natural or preternatural, that projects or advances out beyond the reſt.

PROVEDITOR, an officer in ſeveral parts of Italy, particularly at Venice, who has the direction of matters relating to policy.

PROVENCE, a province or government of France, bounded by Dauphine on the north; by Piedmont on the eaſt; by the Mediterranean on the ſouth; and by the river Rhone, which ſeparates it from Languedoc, on the weſt: it is about an hundred miles long, and near as many broad.

PROVERB, according to Camden, is a conciſe, witty, and wiſe ſpeech, grounded upon experience, and for the moſt part containing ſome uſeful inſtructions.

Book of PROVERBS, a canonical book of the Old Teſtament, containing a part of the proverbs of Solomon the ſon of David king of Iſrael. The firſt twenty-four chapters are acknowleged to be the genuine work of that prince; the next five chapters are a collection of ſeveral of his proverbs, made by order of king Hezekiah; and the two laſt ſeem to have been added, though belonging to different and unknown authors, Agur the ſon of Jakeh, and king Lemuel.

In this excellent book are contained rules for the conduct of all conditions of life; for kings, courtiers, maſters, ſervants, fathers, mothers, children, *&c.*

PROVIDENCE, the conduct and direction of the ſeveral parts of the univerſe, by a ſuperior intelligent Being.

PROVIDENCE-PLANTATION, a colony of New-England, which, with Rhode-iſland, conſtitutes a charter government: its chief town is Newport.

PROVIDENCE is alſo one of the Bahama iſlands, planted and fortified by the Engliſh: W. long. 78°, N. lat. 25°.

PROVINCE, in Roman antiquity, a country of conſiderable extent, which, upon being entirely reduced under the Roman dominion, was new-modelled according to the pleaſure of the conquerors, and ſubjected to the command of annual governors ſent from Rome; being commonly obliged to pay ſuch taxes and contribution as the ſenate thought fit to demand.

PROVINCE, in geography, a diviſion of a kingdom or ſtate, compriſing

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comprising ſeveral cities, towns, &c. all under the ſame government, and uſually diſtinguiſhed by the extent either of the civil or eccleſiaſtical juriſdiction.

PROVINCIAL, ſomething relating to a province. See the preceding article.

PROVOST, of a city or town, is the chief municipal magiſtrate in ſeveral trading cities, particularly Edinburgh, Paris, &c. being much the ſame with mayor in other places.

He preſides in city-courts, and, together, with the baillies, who are his deputies, determines in all differences that ariſe among citizens.

The provoſt of Edinburgh, as well as of all the other conſiderable towns in Scotland, has the title of lord; and the former calls yearly conventions of the royal boroughs to Edinburgh by his miſhives.

PROW, denotes the head or fore-part of a ſhip, particularly in a galley, being that which is oppoſite to the poop or ſtern.

PROXIMITY, denotes the relation of nearneſs, either in reſpect of place, blood, or alliance.

PROXY, a perſon who officiates as a deputy in the room of another.

PRUCH, or BRUGG, a town of Auſtria, in Germany, twenty-two miles ſouth-eaſt of Vienna.

PRUCK, or BRUCH, of Stiria, in Germany, ſixty miles ſouth-weſt of Vienna.

PRUNES, are plumbs dried in the ſunſhine, or in an oven.

PRUNING, in gardening and agriculture, is the lopping off the ſuperfluous branches of trees, in order to make them bear better fruit, grow higher, or appear more regular.

PRUNUS, in botany, a genus of the icoſandria monogynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; and the ſhell of the drupe is full of prominent ſutures. There are 13 ſpecies, five of them natives of Britain, *viz.* the inſititia, or black bullace-tree; the ſpinoſa, or ſloe-tree; the padus, or birds cherry; the avium, or common wild cherry; and the ceraſus, or black cherry.

PRURITIS, denotes an itching ſenſation.

PRUSSIA, a province of Poland, ſituated on the coaſt of the Baltic ſea, and divided into regal and ducal Pruſſia, the firſt ſubject to Poland, and the laſt to the king of Pruſſia.

PRYTANES, in Grecian antiquity, were the preſidents of the ſenate, whoſe authority conſiſted chiefly in aſſembling the ſenate; which, for the moſt part, was done once every day.

The ſenate conſiſted of five hundred, fifty ſenators being elected out of each tribe; after which, lots were caſt, to determine in what order the ſenators of each tribe ſhould preſide, which they did by turns, and during their preſidentſhip were called prytanes. However, all the fifty prytanes of the tribes did not govern all at once, but ten at a time, *viz.* for ſeven days; and after thirty-five days, another tribe came into play, and preſided for other five weeks; and ſo of the reſt.

PSALM, a divine ſong or hymn; but chiefly appropriated to the hundred and fifty Pſalms of David, a canonical book of the Old Teſtament.

Moſt of the Pſalms have a particular title, ſignifying either the name of the author, the perſon who was to ſet it to muſic or ſing it, the inſtrument that was to be uſed, or the ſubject and occaſion of it. Some have imagined, that David was the ſole author of the book of Pſalms; but the titles of many of them prove the contrary, as Pſalm xix. which appears to have been written by Moſes. Many of the Pſalms are inſcribed with the names Korah, Jeduthun, &c. from the perſons who were to ſing them.

PSALMODY, the art or act of ſinging pſalms. See the preceding article.

PSALTER, the ſame with the book of Pſalms. See PSALM.

Among the religious, in the Popiſh countries, the term pſalter is alſo given to a large chaplet or roſary, conſiſting of an hundred and fifty beads, according to the number of pſalms in the palter.

PSALTERY, a muſical inſtrument, much in uſe among the ancient Hebrews, who called it nebel.

We know little or nothing of the preciſe form of the ancient pſaltery.

PSIDIUM, in botany, a genus of the icoſandria monogynia claſs The calix conſiſts of five ſegments, and the corolla of five petals: the berry has but one cell, containing many ſeeds. There are two ſpecies, both natives of India.

PSITTACUS, in ornithology, a genus belonging to the order of picæ. The beak is hooked, the ſuperior mandible being furniſhed with a moveable wax; the noſtrils are placed at the baſe of the beak; the tongue is fleſhy, blunt, and entire; and the feet are fitted for climbing. There are 47 ſpecies, diſtinguiſhed by their colour, and the length of their tails. This genus includes the parrot-kind, which are all natives of warm climates.

PSOAS, in anatomy. See ANATOMY, p. 203.

PSORALIA, in botany, a genus of the diadelphia decandria claſs. The calix is interſperſed with fleſhy points, of the length of the legumen, which contains one ſeed. There are 14 ſpecies, none of them natives of Britain.

PTARMICA, in botany. See ACHILLÆA.

PTELEA, in botany, a genus of the tetrandia monogynia claſs. The calix conſiſts of four ſegments, and the corolla of four petals; the fruit is a roundiſh membrane, with one ſeed in the centre. The ſpecies are two, none of them natives of Britain.

PTERIS, in botany. a genus of the cryptogamia filicum claſs. The fructification is ſituate in lines near the margine. There are 19 ſpecies, only one of them, *viz.* the aquilina, or female fern, is a native of Britain.

PTERYGOID, ſomething reſembling a wing.

PTERYGOIDÆUS, in anatomy. See ANATOMY, p. 221.

PTISAN, is properly barley decorticated, or deprived of its hulls, by beating in a mortar, as was the ancient practice, though the cooling potion, obtained by boiling ſuch barley in water, and afterwards ſweetening the liquor with liquorice-root, is what at preſent goes by the name of ptiſan; and to render it laxative, ſome add a little ſena, or other herb of the ſame intention.

PTOLEMAIC *Syſtem of Aſtronomy*, is that invented by Claudius Ptolemæus, a celebrated aſtronomer and mathematician of Peluſium, in Egypt, who lived in the beginning of the IId century of the Chriſtian æra.

This hypotheſis ſuppoſes the earth immoveably fixed in the centre, not of the world only, but alſo of the univerſe:

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verſe; and that the ſun, the moon, the planets, and ſtars, all move about it, from eaſt to weſt, once in twenty-four hours, in the order following, *viz.* the moon next to the earth, then mercury, venus, the ſun, mars, jupiter, ſaturn, the fixed ſtars, the firſt and ſecond cryſtalline heavens, and above all the fiction of their primum mobile.

PTYALISM, in medicine, a ſalivation, or frequent and copious diſcharge of ſaliva.

PUBERTY, among civilians, *&c.* the age wherein a perſon is capable of procreation, or begetting children. See LAW.

PUBES, among anatomiſts, *&c.* denotes the middle part of the hypogaſtric region of the abdomen, lying between the two inguina or groins. See ANATOMY, p. 257.

PUBLICAN, among the Romans, one who farmed the taxes and public revenues.

PUBLICATION, the act of making a thing known to the world; the ſame with promulgation.

PUDENDA, the parts of generation in both ſexes. See ANATOMY, p. 270.

PUERILITY, in diſcourſe, is defined by Longinus, to be a thought, which, by being too far-fetched, becomes flat and inſipid. Puerility, he adds, is the common fault of thoſe who affect to ſay nothing but what is brilliant and extraordinary.

PUGIL, in phyſic, *&c.* ſuch a quantity of flowers, ſeeds, or the like, as may be taken up between the thumb and two fore-fingers.

It is eſteemed to be the eighth part of the manipule or handful.

PULEX, in zoology, a genus of inſects belonging to the order of aptera. It has ſix feet fitted for leaping, and two eyes; the feelers are like threads; the roſtrum is inflected, ſetaceous, and armed with a ſting; and the belly is compreſſed. There are two ſpecies, *viz.* the irritans, with a proboſcis ſhorter than its body, a native of Europe and America: and the penetrans, with a proboſcis longer than its body, a native of America.

PULLEY, in mechanics, one of the mechanical powers. See MECHANICS.

PULMO, the LUNGS, in anatomy. See ANATOMY, p. 280.

PULMONARIA, in botany, a genus of the pentandria monogynia claſs. The corolla is funnel-ſhaped; and the calix has five ſides. There are ſeven ſpecies, two of them natives of Britain, *viz.* the officinalis, or buglos-cowſlips, the leaves of which are reckoned pectoral and cordiac; and the maritima, or ſea-bugloſs.

PULMONARY VESSELS, in anatomy. See ANATOMY, Part III. and IV. and p. 280.

PULP, in pharmacy, the fleſhy and ſucculent part of fruits, extracted by infuſion or boiling, and paſſed through a ſieve.

PULPIT, an elevated place in a church, whence ſermons are delivered: the French give the ſame name to a reading deſk.

PULSATILLA, in botany. See ANEMONE.

PULSE, in the animal œconomy, denotes the beating or throbbing of the heart and arteries.

With regard to motion, the pulſes are reckoned only four, great and little, quick and ſlow. When quickneſs and greatneſs are joined together, it becomes violent; and when it is little and ſlow, it is called a weak pulſe. They are alſo ſaid to be frequent and rare, equal and unequal; but theſe are not the eſſential affections of motion. Frequency and quickneſs are often confounded with each other. A pulſe is ſaid to be hard or ſoft, with regard to the artery, according as it is tenſe, renitent, and hard, or flaccid, ſoft, and lax. Add to theſe, a convulſive pulſe; which does not proceed from the blood, but from the ſtate of the artery, and is known by a tremulous ſubſultory motion, and the artery ſeems to be drawn upwards: this, in acute fevers, is the ſign of death; and is ſaid to be the pulſe in dying perſons, which is likewiſe generally unequal and intermitting. A great pulſe ſhews a more copious afflux of the blood to the heart, and from thence into the arteries; a little pulſe, the contrary.

PULSE is alſo uſed for the ſtroke with which any medium is affected by the motion of light, ſound, *&c.* through it.

PULSE, in botany, a term applied to all thoſe grains or ſeeds which are gathered with the hand, in contradiſtinction to corn, *&c* which are reaped, or mowed: or it is the ſeed of the leguminous kind of plants, as beans, vetches, *&c.* but it is by ſome uſed for artichokes, aſparagus, *&c.*

PULVERIZATION, the art of pulverizing, or reducing a dry body into a fine powder; which is performed in friable bodies, by pounding or beating them in a mortar, *&c.*

PULVIS, a POWDER. See POWDER.

PUMICE, in natural hiſtory, a ſlag or cinder of ſome foſſil, originally bearing another form, and only reduced to this ſtate by the action of the fire, though generally ranked by authors among the native ſtones. It is a lax and ſpungy matter, frequently of an obſcure ſtriated texture in many parts, and always very cavernous and full of holes; it is hard and harſh to the touch, but much lighter than any other body that comes under the claſs of ſtones. It is found in maſſes of different ſizes, and of a perfectly irregular ſhape, from the bigneſs of a pigeon's egg, to that of a buſhel. We have it from many parts of the world, but particularly from about the burning mountains Ætna, Veſuvius, and Hecla, by whoſe eruptions it is thrown up in vaſt abundance; and being by its lightneſs ſupported in the air, is carried into ſeas at ſome diſtance by the winds, and thence to diſtant ſhores. The great uſe of the pumice among the ancients, ſeems to have been as a dentifrice, and at preſent it is retained in the ſhops on the ſame account.

PUMP, in hydraulics. See HYDROSTATICS, p. 808. *&c.*

Air-PUMP. See PNEUMATICS, p. 491.

PUN, or PUNN, a conceit ariſing from the uſe of two words that agree in ſound, but differ in the ſenſe. Ariſtotle deſcribes two or three kinds of puns among the beauties of good writing, and produces inſtances of them out of ſome of the greateſt authors in the Greek tongue. Cicero has ſprinkled ſeveral of his works with puns; and in his book, where he lays down the rules of oratory, quotes abundance of ſayings, which he calls pieces of wit, that upon examination prove perfect puns.

PUNCH, an inſtrument of iron or ſteel, uſed in ſeveral arts, for the piercing or ſtamping holes in plates of metal, *&c.* being ſo contrived as not only to perforate, but to cut out and take away the piece.

PUNCHEON, a little block or piece of ſteel, on one end whereof is ſome figure, letter, or mark, engraven either in a

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in creux or relievo; impreſſions whereof are taken on metal, or ſome other matter, by ſtriking it with a hammer on the end not engraved.

PUNCHEON is alſo a meaſure for liquids, containing an hogſhead and one third, or eighty-four gallons.

PUNCTUATION, in grammar, the art of pointing, or of dividing a diſcourſe into periods, by points expreſſing the pauſes to be made in the reading thereof.

PUNCTUM SALIENS, in anatomy, the firſt rudiments of the heart in the formation of the fœtus, where a throbbing motion is perceived.

PUNCTURE, in ſurgery, any wound made by a ſharp-pointed inſtrument.

PUNICA, the POMEGRANATE-TREE, in botany, a genus of the icoſandria monogynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; the apple has many cells, containing many ſeeds. There are two ſpecies, both natives of warm climates.

PUNISHMENT, in law, the penalty which a perſon incurs on the breach or tranſgreſſion of any law.

PUPIL, in the civil law, a boy or girl not yet arrived at the age of puberty, *i. e.* the boy under fourteen years, the girl under twelve.

PUPIL is alſo uſed in univerſities, *&c.* for a youth under the education or diſcipline of any perſon.

PUPIL, in anatomy. See ANATOMY, p. 289.

PURCHASE, in law, the buying or acquiring of lands, *&c.* with money, by deed or agreement, and not by deſcent or right of inheritance.

PURE, ſomething free from any admixture of foreign or heterogeneous matters: thus we ſay pure fire, *&c.*

PURFLEW, a term in heraldry, expreſſing ermins, peans, or any of the furs, when they compoſe a bordure round a coat of arms: thus they ſay, he beareth gules a bordure, purflew, vairy; meaning that the bordure is vairy.

PURGATION, the art of purging, ſcouring, or purifying a thing, by ſeparating, or carrying off any impurities found therein: thus,

PURGATIVE, a medicament which evacuates the impurities of the body by ſtool, called alſo cathartics.

PURGATORY, a place in which the juſt who depart out of this life, are ſuppoſed to expiate certain offences which do not merit eternal damnation.

Broughton has endeavoured to prove, that this notion has been held by Pagans, Jews, and Mahometans, as well as by Chriſtians.

The doctrine of purgatory is a very lucrative article to the clergy of the Romiſh church, who are very liberally paid for maſſes and prayers for the ſouls of the deceaſed. We are told by ſome of their doctors, that purgatory is a ſubterraneous place ſituated over the hell of the damned, where ſuch ſouls as have not yet made ſatisfaction to divine juſtice for their ſins, are purged by fire, after a wonderful and incomprehenſive manner: and here they are purified from thoſe dregs which hinder them from entering into their eternal country, as the catechiſm of the council of Trent expreſſes it.

PURIFICATION, in matters of religion, a ceremony which conſiſts in cleanſing any thing from a ſuppoſed pollution or defilement.

The Pagans, before they ſacrificed, uſually bathed or waſhed themſelves in water; and they were particularly careful to waſh their hands, becauſe with theſe they were to touch the victims conſecrated to the gods. It was alſo cuſtomary to waſh the veſſel with which they made their libations. The Mahometans uſe purifications as previous to the duty of prayer: theſe alſo are of two kinds; either bathing; or only waſhing the face, hands and feet. The firſt is requeſted only in extraordinary caſes, as after having lain with a woman, touched a dead *&c.* But leſt ſo neceſſary a preparation for their devotion ſhould be omitted, either where water cannot be had, or when it may be of prejudice to a perſon's health, they are allowed in ſuch caſes to make uſe of fine ſand or duſt inſtead of it; and then they perform this duty by clapping their open hands on the ſand, and paſſing them over the parts, in the ſame manner as if they were dipped in water.

There were alſo many legal purifications among the Hebrews. When a woman was brought to bed of a male-child, ſhe was eſteemed impure for forty days; and when of a female, for ſixty; at the end of which time ſhe carried a lamb to the door of the temple, to be offered for a burnt-offering, and a young pigeon or turtle for a ſin-offering, and by this ceremony ſhe was cleanſed or purified.

PURIM, or *the feaſt of lots*, a ſolemn feſtival of the Jews, inſtituted in memory of the deliverance they received from Haman's wicked attempt to deſtroy them, by means of Mordecai and Eſther.

PURITAN, a name formerly given in deriſion to the diſſenters from the church of England, on account of their profeſſing to follow the pure word of God, in oppoſition to all traditions and human conſtitutions.

PURLINS, in building, thoſe pieces of timber that lie acroſs the rafters on the inſide, to keep them from ſinking in the middle of their length.

PURLUE, or PURLIEU, ſignifies all that ground near any foreſt, which being made foreſt by king Henry II. Richard I. and king John, was afterwards by perambulations and grants of Henry III. ſevered again from the ſame, and made purlieu; that is to ſay, pure and free from the laws of the foreſt.

PURPLE, a colour compoſed of a mixture of red and blue.

A beautiful tranſparent purple for painting may be made by boiling four ounces of raſped braſil-wood in a pint of ſtale beer, and half an ounce of logwood, till the liquor is heightened to the colour you deſire, which may be known by dipping a piece of paper in it. If you find it too red, add a quarter of an ounce more of logwood, which will render it ſtill deeper; and by this method you may bring it to any degree of purple, by putting in either more or leſs logwood to the former compoſition, and fixing it with alum.

PURPURA, in natural hiſtory. See MUREX.

PURPURE, or PURPLE, in heraldry, according to ſome, is one of the five colours of armories, compounded of gules and azure, bordering on violet, and, according to others, of a great deal of red and a little black. But it was excluded by the ancient heralds as only an imperfect colour. In the coats of noblemen it is called amethyſt; and in thoſe of princes, mercury. It is repreſented in engraving, by diagonal lines drawn from the ſiniſter chief to the dexter baſe points. See Plate CXLVII. fig. 3.

PURSER, an officer aboard a man of war, who receives her victuals from the victualler, ſees that it be well ſtowed, and

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and keeps an account of what he every day delivered to the ſteward. He alſo keeps a liſt of the ſhip's company, and ſets down exactly the day of each man's admiſſion, in order to regulate the quantity of proviſions to be delivered out, and that the paymaſter or treaſurer of the navy may iſſue out the diſburſements, and pay off the men, according to his book.

PURSLAIN, in botany. See PORTULACA.

PURVIEW, a term uſed by ſome lawyers for the body of an act of parliament, or that part which begins with, Be it enacted, *&c.* as contradiſtinguiſhed from the preamble.

PURULENT, in medicine, ſomething mixed with, or partaking of, pus or matter.

PUS, in medicine, a white or yelloviſh putrid matter, deſigned by nature for the healing and cementing of wounds or ſores.

PUSTULE, a pimple, or ſmall eruption on the ſkin full of pus; ſuch are the puſtules of the ſmall-pox and frenchpox. See MEDICINE.

PUTORIUS. in zoology. See MUSTELA.

PUTREFACTION. See CHEMISTRY, p. 98.

PUTTY, is a kind of paſte, compounded of whiting and linſeed oil, beaten together to the conſiſtence of thick dough.

It is uſed by glaziers for the faſtening in the ſquares of glaſs in ſaſh-windows, and by painters for ſtopping up the crevices and clefts in timber and wainſcots, *&c.*

PYCNOSTYLE, in the ancient architecture, is a building where the columns ſtand very cloſe to each other; only one diameter and a half of the column being allowed for the intercolumniations.

PYGARGUS, in ornithology. See FALCO.

PYGMY, a perſon not exceeding a cubit in height.

This appellation is given by the ancients to a fabulous nation ſaid to have inhabited Thrace; who brought forth young at five years of age, and were old at eight; theſe were famous for the bloody war they waged with the cranes.

PYLORUS. in anatomy. See ANATOMY, p. 258.

PYRAMID, in geometry, a ſolid ſtanding on a triangular, ſquare, or polygonal baſis, and terminating in a point at the top; or, according to Euclid, it is a ſolid figure, conſiſting of ſeveral triangles, whoſe baſes are all in the ſame plane, and have one common vertex.

PYRAMID, in architecture, a ſolid maſſive building, which from a ſquare, triangular, or other baſe, riſes diminiſhing to a vertex or point.

Pyramids are ſometimes uſed to preſerve the memory of ſingular events; and ſometimes to tranſmit to poſterity the glory and magnificence of princes. But as they are eſteemed a ſymbol of immortality, they are moſt commonly uſed as funeral monuments. Such is that of Ceſtius at Rome; and thoſe other celebrated ones of Egypt, as famous for the enormity of their ſize, as their antiquity. Theſe are ſituated on the weſt ſide of the Nile, almoſt oppoſite to Grand Cairo; the baſe of the largeſt covers more than ten acres of ground; and is, according to ſome, near ſeven hundred feet high; though others make it but ſix hundred, and ſome but little more than five hundred. The pyramid is ſaid to have been, among the Egyptians, a ſymbol of human life; the beginning of which is repreſented by the baſe, and the end by the apex; on which account it was that they uſed to erect them over ſepulchres.

PYRAMIDALIA CORPORA, in anatomy. See ANATOMY, p. 287.

PYRAMIDALIS, in anatomy. See ANATOMY, p. 193.

PYRENEAN MOUNTAINS divide France from Spain, and are not inferior to the Alps in height: they extend from the Mediterranean to the ocean, upwards of two hundred miles in length, the greateſt breadth being about one hundred and twenty.

PYRIFORMIS, in anatomy. See ANATOMY, p. 205.

PYRITES. See CHEMISTRY, p. 117.

PYRMONT, the capital of a county of that name in the circle of Weſtphalia in Germany, ſituated on the confines of the duchy of Brunſwick, in E long. 9°, N. lat. 52°, from whence we receive the beſt mineral waters in Germany.

PYROLA, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; and the capſule has five cells. There are ſix ſpecies, three of them natives of Britain, *viz.* the rotundifolia, or common winter-green; the minor, or leſſer winter-green; and the ſecunda, or dented leaved winter-green.

PYROMANCY, a kind of divination by means of fire. The ancients imagined they could foretel future events, by inſpecting fire and flame; and to this end, they conſidered its direction, which way it turned; ſometimes they added other matters to the fire, ſuch as a veſſel full of urine, having its neck bound about with wool, watching narrowly on which ſide it burſt, and thence taking their augury: ſometimes they threw pitch on it; and, if it took fire immediately, they eſteemed it a good augury.

PYROTECHNY, the art of fire, or a ſcience which teaches the management and application of fire in ſeveral operations. See CHEMISTRY.

PYROTICS, in medicine, cauſtics, or remedies, either actually or potentially hot; and which accordingly will burn the fleſh, and raiſe an eſchar. See CAUSTICS.

PYRRHICHA, in antiquity, a kind of exerciſe on horſeback. or a feigned combat. for the exerciſe of the cavalry.

PYRRHICHIUS, in the Greek and Latin poetry, a foot conſiſting of two ſyllables, both ſhort; as, *Deus*.

PYRRHONIANS, a ſect of ancient philoſophers, ſo called from Pyrrho, a native of Elis, in Peloponneſus. The opinions of theſe philoſophers, who were alſo called ſceptics, terminated in the incomprehenſibility of all things, in which they found reaſon both for affirming and denying; accordingly they ſeemed, during their whole lives, to be in ſearch of truth, without ever acknowledging that they had found it: hence the art of diſputing upon all things, without ever going farther than ſuſpending our judgment, is called pyrrhoniſm.

PYRUS, in botany, a genus of the icoſandria pentagynia claſs. The calix conſiſts of 5 ſegments, and the corolla of five petals; the apple has five cells, containing many ſeeds. There are four ſpecies, two of them natives of Britain, *viz.* the communis, or wild pear-tree; and the malus, or crab-apple.

PYTHAGOREANS, a ſect of ancient philoſophers, ſo called from their being the followers of Pythagoras of Samos, who lived in the reign of Tarquin the laſt king of the Romans, in the year of Rome 220; or, according

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to Livy, in the reign of Servius Tullius, in the year of the world 3472.

His maxims of morality were admirable; for he was for having the ſtudy of philoſophy ſolely tend to elevate man to a reſemblance of the Deity. He believed that God is a ſoul diffuſed through all nature, and that from him human ſouls are derived; that they are immortal; and that men need only take pains to purge themſelves of their vices, in order to be united to the Deity. He made unity the principle of all things; and believed, that between God and man there are various orders of ſpiritual beings, who are the miniſters of the Supreme Being. He condemned all images of the Deity, and would have him worſhipped with as few ceremonies as poſſible. His diſciples brought all their goods into a common ſtock, contemned the pleaſures of ſenſe, abſtained from ſwearing, eat nothing that had life, and believed in the doctrine of a metempſychoſis. See METEMPSYCHOSIS.

Pythagoras made his ſcholars undergo a ſevere noviciate of ſilence for at leaſt two years; and it is ſaid, that where he diſcerned too great an itch for talking, he extended it to five. His diſciples were therefore divided into two claſſes: of which the firſt were ſimple hearers; and the laſt ſuch as were allowed to propoſe their difficulties, and learn the reaſons of all that was taught there. The Pythagoreans, it is ſaid, on their riſing from bed, rouſed the mind with the ſound of the lyre, in order to make them more fit for the actions of the day; and at night reſumed the lyre, in order to prepare themſelves for ſleep, by calming all their tumultuous thoughts. The figurative manner in which he gave his inſtructions, was borrowed from the Hebrews, Egyptians, and other orientals. Some think he derived his philoſophy from the books of Moſes, and that he converſed with Ezekiel and Daniel at Babylon; but this is mere conjecture.

Some authors ſay, that he left nothing in writing; but Laërtius and others attribute ſeveral treatiſes to him. His golden verſes, attributed by ſome to one of his diſciples, are allowed to be an exact copy of the ſentiments of that divine philoſopher, from whoſe ſchool proceeded the greateſt philoſophers and legiſlators.

PYTHIA, in antiquity, the prieſteſs of Apollo at Delphi, by whom he delivered oracles; ſhe was thus called from the god himſelf, who was denominated Apollo Pythios, from his ſlaying the ſerpent Python.

Q.

QUA

QUACK, among phyſicians, the ſame with empiric. See EMPIRIC.

QUADRAGESIMA, a denomination given to lent, from its conſiſting of forty days. See LENT.

QUADRANGLE, in geometry, the ſame with a quadrilateral figure, or one conſiſting of four ſides and four angles.

QUADRANS, the quarter or fourth part of any thing, particularly the *as*, or pound.

QUADRANT, in geometry, the arch of a circle, containing 90°, or the fourth part of the entire periphery.

QUADRANT alſo denotes a mathematical inſtrument, of great uſe in aſtronomy and navigation, for taking the altitudes of the ſun and ſtars. See ASTRONOMY, p. 451.

QUADRAT, a mathematical inſtrument, called alſo a geometrical ſquare, and line of ſhadows: it is frequently an additional member on the face of the common quadrant, as alſo on thoſe of Gunter's and Sutton's quadrant.

QUADRAT, in aſtrology, the ſame with quartile. See QUARTILE.

QUADRAT, in printing, a piece of metal caſt like the letters, to fill up the void ſpaces between words, *&c.* There are quadrats of different ſizes, as m-quadrats, n-quadrats, *&c.* which are, reſpectively, of the dimenſions of theſe letters.

QUADRATIC EQUATION, in algebra. See ALGEBRA, p. 90.

QUADRATRIX, in geometry, a mechanical line, by means whereof we can find right lines equal to the circumference of circles, or other curves, and their ſeveral parts.

QUADRATRIX *of Dinoſtrates*, ſo called from its inventor Dinoſtrates, is a curve, whereby the quadrature of the circle is effected mechanically.

QUADRATURE, in geometry, denotes the ſquaring, or reducing a figure to a ſquare. Thus, the finding of a ſquare, which ſhall contain juſt as much ſurface or area as a circle, an ellipſis, a triangle, *&c.* is the quadrature of a circle, ellipſis, *&c.* See GEOMETRY.

QUADRATURE, in aſtronomy, that aſpect of the moon, when ſhe is 90° diſtant from the ſun. See ASTRONOMY.

QUADRATUS, in anatomy, a name given to ſeveral muſcles on account of their ſquare figure. See ANATOMY, Part II.

QUADREL, in building, a kind of artificial ſtone, ſo called from its being perfectly ſquare.

The quadrels are made of chalky earth, *&c.* and dried in the ſhade for two years. Theſe were formerly in great requeſt among the Italian architects.

QUADRIENNIUM UTILE, in Scots law. See LAW, Tit. vii. 17.

QUADRIGA, in antiquity, a car or chariot drawn by four horſes

On the reverſes of medals, we frequently ſee the emperor or victory in a quadriga, holding the reins of the horſes; whence theſe coins are, among the curious, called nummi quadrigati, and victoriati.

QUADRILATERAL, in geometry, a figure whoſe perimeter conſiſts of four right lines, making four angles; whence it is alſo called a quadrangular figure.

QUADRILLE, a little troop or company of cavaliers, pompouſly dreſſed, and mounted for the performance of carouſals.

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rousals, justs, tournaments, runnings at the ring, and other gallant divertisements.

QUADRILLE, is also a game at cards, to be learned only by practice.

QUADRUPEDS, in zoology. See NATURAL-HISTORY.

QUASI CONTRACT, in Scots law. See LAW, Tit xxii. 14.

QUESTUS, in law, signifies whatever a person has by purchase; as hereditas denotes that which one has by descent, or hereditary right.

QUAIL. See TETRAO.

QUAKERS, a religious society that began to be distinguished by this name in England, where it first took its rise, about the middle of the last century.

In treating of this people, we shall deviate from the generality of those who have mentioned them in their writings, by exhibiting the account which they give of themselves, without making ourselves answerable for their principles or their practices.

William Sewel, a Dutchman, published, in the year 1717, the history of this people. He was one of their persuasion, a man of learning, and known to the public by his dictionary of the Dutch and English languages. He had access to all their records, corresponded with the most eminent, lived at the time when the facts he recorded were recent, and we have not heard that any part of his history has been controverted; and as we are informed that it has been published by the approbation of the quakers, we may therefore consider it as an authentic history of their rise, progress, and principal opinions.

George Fox, (for whose birth and parentage, see page 6th of Sewel's History, *&c.*) was the first of this people. He was of a grave, sedate turn from his infancy; always averse to the follies of youth, and desirous of nothing so much as to be preserved in innocence and simplicity. He was early remarked as an example in these respects, and of inflexible integrity. When a youth, he was desirous above all things to please God, and cautiously avoided every thing that either scripture or the dictates of his own conscience taught him to believe were offensive. As he grew up, this disposition increased: it cost him much anxiety, much distress; but at length he was satisfied in respect to many doubts he had admitted, and gained much experience by the things he had suffered. This enabled him to instruct others; and about the year 1647, we find him travelling through several countries in England, seeking out such as had any religious tenderness, and exciting the inquiries of many concerning him. Many embraced his opinions; and indeed he seems to have roused the public mind as much as any individual ever did in those countries, for the time and under such circumstances. A man of low birth, without literature, merely by the sanctity of his life, the simplicity of his doctrines, to have collected from all professions, and most ranks, men of character, fortune, and understanding, and embodied them as a religious society; to have instituted one of the best concerted plans of civil discipline; is a circumstance most true, and not unworthy the disquisitions of the ablest philosophers.

The name of *Quaker* was fixed to this people early, by way of reproach. In their assemblies it sometimes happened, that some were so far struck with the remembrance of their past follies and forgetfulness of their condition, others so deeply affected with a sense of God's mercies to them, that they actually trembled and quaked. The nickname so suited the vulgar taste, that it immediately became general. *Friends*, or *the friends of truth* was the name they were commonly known by to one another; but the epithet abovementioned was stamped upon them by their adversaries, and perhaps indelibly.

The following abstract from the propositions of our countryman, the eminent Barclay, will perhaps exhibit as clear a summary of their opinions as can well be comprised within the limits allowed to this article.

1. The height of all happiness is placed in the true knowledge of God. 2. The true knowledge of God is alone to be obtained by the revelation of the Spirit of God. 3. The revelation of the Spirit of God to the saints has produced the scriptures of truth. 4. From whence it appears, that mankind in general is fallen and degenerated. 5. That God out of his infinite love hath offered universal redemption by Christ, who tasted death for every man. 6. That there is an evangelical and saving light and grace in all. 7. That as many as resist not this light, but receive the same, in them are produced holiness, righteousness, purity, and the fruits which are acceptable to God: 8. Even so as to arrive at a state of freedom from actual sinning and transgressing the law of God; 9. Yet with a possibility of sinning. 10. That as all true knowledge in things spiritual is received by the Spirit of God, so by it every true minister of the gospel is ordained and prepared for the ministry; and as they have freely received, so are they freely to give. 11. That the true worship of God is in spirit and in truth; not limited to place or time, or subject to the intervention of any person; but is to be performed under the moving of the Holy Spirit in our hearts, yet without derogating from the necessity and utility of public united worship, (in which their sufferings and constancy have been most remarkable). 12 That baptism is a pure and spiritual thing, the baptism of the spirit and fire. 13. That the communion of the body and blood of Christ is inward and spiritual. 14. That it is not lawful for any human authority to force the consciences of others on account of difference in worship or opinion, except such opinions tend to the prejudice of his neighbour in his life or estate, or are inconsistent with human society. 15. That as the end of religion is to redeem man from the spirit of this world, and to lead into inward communion with God; therefore all vain customs and habits are to be rejected, which tend to divert the mind from a sense of the fear of God, and that evangelical spirit wherewith Christians ought to be leavened.

Such are the sentiments of this people as proposed to the public by their apologist, who has largely commented on these topics in a work that has passed through no less than eight editions in English, and has been printed in most of the modern languages.

Their particularities of address, language, and behaviour; their declining the use of arms, even in their own defence; their refusing to pay tithes, or contribute to the support of ministers in any shape; likewise their refusing to swear or take an oath on any occasion whatever; have subjected them to much obloquy, and many grievous sufferings. On what principles, and by what arguments, they vindicate themselves from the objections raised against them by their adversaries, may be seen in this elaborate

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borate performance. Government has, however, in many inſtances, extended to this people great indulgencies; convinced, no doubt, by their patient ſuffering, that their profeſſions of conſcientious ſcruples were ſincere, and that nothing dangerous to ſociety could be apprehended from a people who diſclaimed the uſe of arms both offenſive and defenſive. The œconomy of this ſociety likewiſe deſerves our notice. It appears by their hiſtory, that ſoon after the preaching of George Fox had drawn together in many parts of England conſiderable bodies of people profeſſing the ſame opinions, he found it expedient for their better government to eſtabliſh regular meetings for diſcipline. The following is, as nearly as we can collect, the plan that is eſtabliſhed amongſt them.

Where there are any Quakers, they meet together every month, to conſider of the neceſſities of their poor, and to provide for their relief; to hear and determine complaints ariſing among themſelves; to inquire into the converſation of their reſpective members in regard to morality and conformity to their religious ſentiments; to allow the paſſing of marriages; and to enjoin a ſtrict regard to the peace and good order of the ſociety, the proper education of their young people, and a general attention to the principles and practices of their profeſſions. In every country where there are monthly meetings, a meeting of the like kind is held, and for ſimilar purpoſes, every quarter. This meeting conſiſts of deputies ſent from the ſeveral monthly meetings, who are charged with anſwers in writing to queries propoſed to them reſpecting the good order of the ſociety. At theſe meetings appeals are received, in caſe of any diſputes; and differences ſettled, if poſſible. Advices are given as occaſions offer, and aſſiſtance afforded to any of the monthly meetings, in caſe of a larger proportion of poor, or any ſimilar expences. As there are Quakers in moſt parts of England, there are few counties which have not theſe quarterly meetings. And from theſe are deputed 4, 6 or 8 of their members once a-year to their annual aſſembly at London.

The annual meeting is commonly held in Whitſunweek, not from any ſuperſtitious reference, as they ſay, to the effuſion of the Holy Ghoſt at the time of petecoſt, but merely as it is a ſeaſon moſt generally convenient to the body. At this anniverſary meeting, conſiſting of deputies from every quarterly meeting, and a number of the moſt judicious of their perſuaſion in London, ſelected for the purpoſe of acting on all emergencies for the good of the ſociety, accounts are received of the ſtate of the ſociety in every part of the world where it exiſts. The deputies bring with them accounts ſigned by order of the reſpective quarterly meetings, informing the yearly meeting, if any diſunion appears; if there is any neglect in regard to the religious education of their youth; if the poor are well provided for; if they keep to their teſtimony againſt paying tythes, againſt bearing arms; if they pay the king his duties, cuſtoms, and exciſe, and forbear to deal in goods ſuſpected to be run. Appeals are here received, and finally determined; propoſitions received, and conſidered; and rules formed on particular emergencies: And, laſtly, ſuch advices are ſent to the ſubordinate meetings as the particular or general ſtate of the ſociety requires.

Perhaps this is the only ſociety in the world that have allowed any ſhare in the management of their affairs to the female ſex; which they do upon the principle that male and female are one in Chriſt. Accordingly we find them in every department of their inſtitution. They have women-preachers, for whom the celebrated Locke made an excellent apology. Theſe have alſo their meetings of diſcipline; in which the like care is taken in regard to the female youth, and the good order of their ſex, as is done by the men in reſpect to their own. And when we reflect what a number of individuals of both ſexes are kept in good order by the police of this ſociety, how few of them are brought into courts of juſtice as delinquents, how peaceable their behaviour, and how exemplary their conduct, we cannot but think their principles deſerve a more accurate examination than has hitherto been attempted, owing perhaps to the vulgar prejudices circulated againſt them. We ſhall cloſe this article with obſerving, that, according to the beſt of our information, neither their miniſters, nor thoſe who have the principal care of the ſociety, enjoy any pecuniary emolument or advantages. A few clerks only receive ſalaries for keeping their records; ſo that perhaps there is not a religious ſociety now exiſting, where principle has greater influence in promoting the ends of their inſtitution.

It is remarkable, that all the ſettlements of the Europeans in America, except the Quaker ſettlement of Penſilvania, were made by force of arms, with very little regard to any prior title in the natives. The kings of Spain, Portugal, France, and Britain, together with the States of Holland, then the only maritime powers, gave grants of ſuch parts of America as their people could lay hold on, ſtudying only to avoid interference with their European neighbours. But Mr Penn, being a Quaker, did not think his powers from king Charles II. a ſufficient title to the country ſince called Penſilvania: He therefore aſſembled the ſachems or princes then in that country, and purchaſed from them the extent of land that he wanted. The government of this province is moſtly in the hands of the Quakers, who never have any quarrels with the natives. When they deſire to extend their ſettlements, they purchaſe new lands of the ſachems, never taking any thing from them by force. How unlike is this conduct to that of the Spaniards, who murdered millions of the natives of Mexico, Terra Firma, Peru, Chili, &c. The barbarities uſed to theſe poor Indians in conquering their country, and forcing them to diſcover their gold, are a reproach to human nature.

QUALITY. is defined by Mr Locke, to be the power in a ſubject of producing any idea in the mind. See METAPHYSICS.

Chemical QUALITIES, thoſe qualities principally introduced by means of chemical experiments, as fumigation, amalgamation, cupellation, volatilization, precipitation, &c. See CHEMISTRY.

QUALITY is alſo uſed for a kind of title given to certain perſons, in regard of their territories, ſignories, or other pretenſions.

QUAMSI, a province of China, bounded by the province of Yunan on the weſt, by Queycheu on the north, by Quamtum on the eaſt, and by Tonquin on the ſouth.

QUAMTUM, or CANTON, a province of China, bounded by Huguam and Kiamſi on the north, by Foken on the eaſt, by the ocean on the ſouth, and by Quamſi on the weſt.

QUAN-

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QUANTITY, any thing capable of eſtimation, or menſuration; or which, being compared with another thing of the ſame kind, may be ſaid to be greater or leſs than it, equal or unequal to it. See ARITHMETIC, ALGEBRA, GEOMETRY.

QUANTITY, in grammar, an affection of a ſyllable, whereby its meaſure, or the time wherein it is pronounced, is aſcertained; or that which determines the ſyllable to be long or ſhort.

QUARANTINE, is uſed for a term of forty days, which veſſels, coming from places ſuſpected of contagion, are obliged to wait in certain places appointed to air themſelves, before they come into port. See LAZAR-HOUSE.

QUARRY, a place under ground, out of which are got marble, free-ſtone, ſlate, lime-ſtone, or other matters proper for buildings.

QUARRY or QUARREL, among glaziers, a pane of glaſs, cut in a diamond form.

QUART, a meaſure containing the fourth part of ſome other meaſure.

QUARTAN, in medicine, a ſpecies of intermitting fever. See MEDICINE.

QUARTATION, a method of purifying gold, by melting three parts of ſilver with one of gold, and then throwing the mixture into aqua-fortis. See CHEMISTRY, p. 129.

QUARTER, the fourth part of any thing.

Quarter, in weights, is generally uſed for the fourth part of an hundred weight averdupois, or 28 lb.

Uſed as the name of a dry meaſure, quarter is the fourth part of a ton in weight, or eight buſhels.

QUARTER, in aſtronomy, the fourth part of the moon's period.

QUARTER, in heraldry, is applied to the parts or members of the firſt diviſion of a coat that is quartered, or divided into four quarters. See QUARTERING.

Franc-QUARTER, in heraldry, is a quarter ſingle or alone; which is to poſſeſs one fourth part of the field.

This makes one of the honourable ordinaries of a coat.

QUARTER MASTERS, or QUARTEERS, in a man of war, are officers whoſe buſineſs it is to rummage, ſtow, and trim the ſhip in the hold; to overlook the ſteward in his delivery of victuals to the cook, and in pumping or drawing out beer, or the like. They are alſo to keep their watch duly, in conning the ſhip, or any other duty

QUARTER-MASTER, an officer in the army, whoſe buſineſs is to look after the quarters of the ſoldiers; of which there are ſeveral kinds, *viz* The quarter-maſter general, whoſe buſineſs is to provide good quarters for the whole army; quarter-maſter of horſe, he who is to provide quarters for a troop of horſe; quarter-maſter of foot, he who is to provide quarters for a regiment of foot.

QUARTERING, in the ſea language, is diſpoſing the ſhip's company at an engagement, in ſuch a manner as that each may readily know where his ſtation is, and what he is to do.

QUARTERING, in heraldry, is dividing a coat into four or more quarters, or quarterings, by parting, couping, *&c.* that is, by perpendicular and horizontal lines, *&c.*

QUATUOR-VIR, in antiquity, formerly written IIII. VIR, a Roman magiſtrate who had three colleges joined with him in the ſame adminiſtration, and had the care of conducting and ſettling the colonies ſent into the provinces.

There were alſo quatuor-viri appointed to inſpect and take care of repairs, *&c.*

QUAVER, in muſic, a meaſure of time equal to half a crotchet, or an eighth of a ſemibreve. See MUSICK.

QUEBEC, the capital of Canada, in North America, ſituated on the weſt ſide of the river of St Lawrence, 300 miles north-weſt of Boſton in New England: W. long. 74°, N. lat. 47° 35′.

QUEEN, a woman who holds a crown ſingly.

The title of queen is alſo given by way of courteſy to her that is married to a king, who is called by way of diſtinction queen-conſort; the former being termed queen-regent. The widow of a king is alſo called queen, but with the addition of dowager.

QUEEN'S-COUNTY, a county of Ireland, bounded by King's-county, on the north; by Kildare, on the eaſt; by Kilkenny, on the ſouth; and by the province of Munſter, on the weſt.

QUEEN'S FERRY, a town of Scotland, on the ſouth ſide of the river Forth, ten miles weſt of Edinburgh.

QUEENBOROUGH, a borough town of the iſle of Sheppy, in Kent, twelve miles north-weſt of Canterbury. It ſends two members to parliament.

QUERCUS, in botany, a genus of the monœcia polyandria claſs. The calix of the male has five ſegments; it has no corolla; and the ſtamina are from five to ten. The calix of the female is one entire, rough leaf; it has no corolla; the ſtyli are from two to five; and the ſeed is ovated. There are 14 ſpecies, only one of them, *viz.* the robur, or common oak, a native of Britain.

QUERCY, the ſouth-eaſt diviſion of the province of Guienne, in France, have Limoſin on the north, and Languedoc on the ſouth.

QUERIA, in botany, a genus of the triandria trigynia claſs. The calix conſiſts of five leaves; it has no corolla; and the capſule has one cell and one ſeed. There are two ſpecies, none of them natives of Britain.

QUESTION, in logic, a propoſition propoſed by way of interrogation. See LOGIC.

QUESTOR, in Roman antiquity, an officer who had the management of the public treaſure.

The queſtorſhip was the firſt office any perſon could bear in the commonwealth, and gave a right to ſit in the ſenate.

At firſt there were only two; but afterwards two others were created, to take care of the payment of the armies abroad, of the ſelling plunder, booty, *&c.* for which purpoſe they generally accompanied the conſuls in their expeditions: on which account they were called peregrini, as the firſt and principal two were called urbani.

The number of queſtors was afterwards greatly increaſed. They had the keeping of the decrees of the ſenate: and hence came the two offices of queſtor principis, or auguſti, ſometimes called candidatus principis, whoſe office reſembled in moſt reſpects that of our ſecretaries of ſtate; and the quæſtor palatii, anſwering in a great meaſure to our lord chancellor.

QUEUE, in heraldry, ſignifies the tail of a beaſt: thus if a lion be borne with a forked tail, he is blazoned double queued.

QUICK, or QUICKSET HEDGE, among gardeners, denotes all live hedges, of whatever ſort of plants they are compoſed, to diſtinguiſh them from dead hedges: but in a

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more ſtrict ſenſe of the word, it is reſtrained to thoſe planted with the hawthorn, under which name theſe young plants, or ſets, are ſold by the nurſery-gardeners who raiſe them for ſale.

QUICKSILVER. See CHEMISTRY, p. 85.

QUIETISTS, a religious ſect, which made a great noiſe towards the cloſe of the laſt century.

They were ſo called from a kind of abſolute reſt and inaction, which they ſuppoſed the ſoul to be in when arrived at that ſtate of perfection which they called the unitive life; in which ſtate, they imagined the ſoul wholly employed in contemplating its God, to whoſe influence it was entirely ſubmiſſive, ſo that he could turn and drive it where and how he would. In this ſtate, the ſoul no longer needs prayers, hymns, *&c.* being laid, as it were, in the boſom, and between the arms of its God, in whom it is in a manner ſwallowed up

The Mahometans ſeem to be no ſtrangers to quietiſm. They expound a paſſage in the ſeventieth chapter of the Koran, viz. *O thou ſoul, which art at reſt, return unto thy Lord*, &c. of a ſoul, which having, by purſuing the concatenation of natural cauſes, raiſed itſelf to the knowledge of that Being which produced them, and exiſts of neceſſity, reſts fully contented, and aquieſces in the knowledge, *&c.* of him, and in the contemplation of his perfections.

QUILLS, the large feathers taken out of the end of the wing of a gooſe, crow, *&c.*

Quills are denominated from the order in which they are fixed in the wing, the ſecond and third quills being the beſt for writing, as they have the largeſt and roundeſt barrels.

In order to harden a quill that is ſoft, thruſt the barrel into hot aſhes, ſtirring it till it is ſoft; then taking it out, preſs it almoſt flat upon your knee with the back of a penknife, and afterwards reduce it to a roundneſs with your fingers. If you have a number to harden, ſet water and alum over the fire; and while it is boiling put in a handful of quills, the barrels only, for a minute, and then lay them by.

QUINCE, in botany. See PYRUS.

QUINCUNX, in Roman antiquity, denotes any thing that conſiſts of five twelfth-parts of another, but particularly of the as.

QUINDECAGON, in geometry, a plain figure with fifteen ſides and fifteen angles.

QUINDECEMVIRI, in Roman antiquity, a college of 15 magiſtrates, whoſe buſineſs it was to preſide over the ſacrifices.

They were alſo the interpreters of the Sibyl's books; which, however, they never conſulted but by an expreſs order of the ſenate.

QUINQUAGENARIUS, in Roman antiquity, an officer who had the command of fifty men.

QUINQUAGESIMA SUNDAY, Shrove Sunday, ſo called as being about the fiftieth day before Eaſter.

QUINQUATRIA, in Roman antiquity, feſtivals celebrated in honour of Minerva, with much the ſame ceremonies as the panathenæa were at Athens.

QUINQUEFOLIUM, in botany. See POTENTILLA.

QUINQUENNALIS, in Roman antiquity, a magiſtrate in the colonies and municipal cities of that empire, who had much the ſame office as the ædile at Rome.

QUINQUEREMIS, in antiquity, a galley with five rows of oars

QUINQUEVIRI, in Roman antiquity, an order of five prieſts, peculiarly appointed for the ſacrifices to the dead, or celebrating the rites of Erebus.

QUINQUINA. See CINCHONA.

QUINTESSENCE, in chemiſtry, a preparation conſiſting of the eſſential oil of ſome vegetable ſubſtance mixed and incorporated with ſpirit of wine.

QUINTESSENCE, in alchemy, is a myſterious term, ſignifying the fifth, or laſt and higheſt eſſence of power or a natural body.

QUINTILE, in aſtronomy, an aſpect of the planets, when they are 72 degrees diſtant from one another, or a fifth part of the zodiac.

QUINTILIANS, a ſect of ancient heretics, thus called from their propheteſs Quintilia. In this ſect the women were admitted to perform the ſacerdotal and epiſcopal functions. They attributed extraordinary gifts to Eve for having firſt eaten of the tree of knowledge; told great things of Miriam the ſiſter of Moſes, as having been a propheteſs, *&c.* They added that Philip the deacon had four daughters who were all propheteſſes, and were of their ſect. In theſe aſſemblies it was uſual to ſee the virgins entering in white robes, perſonating propheteſſes.

QUINZY, QUINSEY, or ANGLINA. See MEDICINE, p. 84.

QUIRE of paper, the quantity of 24 or 25 ſheets.

QUIRINALIA, in antiquity, a feaſt celebrated among the Romans in honour of Romulus, who was called Quirinus. Theſe feaſts were held on the 13th of the kalends of March.

QUIRITES, in antiquity, a name given to the people of Rome, chiefly the common citizens, as diſtinguiſhed from the ſoldiery.

QUOIN, or COIN, on board a ſhip, a wedge faſtened on the deck cloſe to the breech of the carriage of a gun, to keep it firm up to the ſhip-ſide.

Cantic quoins are ſhort three-legged quoins put between caſks to keep them ſteady.

QUOINS, in architecture, denote the corners of brick or ſtone walls. The word is particularly uſed for the ſtones in the corners of brick-buildings. When theſe ſtand out beyond the brick-work, their edges being chamfered off, they are called ruſtic quoins.

QUOTIDIAN, in medicine. See MEDICINE, p. 62.

QUOTIENT, in arithmetic. See ARITHMETIC, p. 376.

R.

RAAB, a city of Lower Hungary, ſituated at the confluence of the rivers Danube and Raab, and ſubject to the houſe of Auſtria: E. long. 18°, N. lat. 48°.

RABBI, or RABBINS, a title which the phariſees and doctors

tors of the law among the Jews aſſumed, and literally ſignifies maſters, or excellents.

There were ſeveral gradations before they arrived at the dignity of a rabbin, which was not conferred till they had acquired the profoundeſt knowledge of the law and the traditions. It does not however appear, that there was any fixed age, or previous examination neceſſary; but when a man had diſtinguiſhed himſelf by his ſkill in the written and oral law, and paſſed through the ſubordinate degrees, he was ſaluted a rabbin by the public voice.

Among the modern Jews, for near ſeven hundred years paſt, the learned men retain no other title than that of rabbi, or rabbins; they have great reſpect paid them, have the firſt places or ſeats in their ſynagogues, determine all matters of controverſy, and frequently pronounce upon civil affairs; they have even a power to excommunicate the diſobedient.

RABBIT, in zoology. See LEPUS.

RACE, in general, ſignifies running with others in order to obtain a prize, either on foot, or by riding on horſeback, in chariots, *&c.*

RACE, in genealogy, a lineage or extraction continued from father to ſon.

RACHITIS, the RICKETS. See MEDICINE, p. 169.

RACK, an engine of torture, furniſhed with pullies and cords, *&c.* for extorting confeſſion from criminals.

RACK, a ſpirituous liquor made by the Tartars of Tonguſia. This kind of rack is made of mare's milk, which is left to be ſour, and afterwards diſtilled twice or thrice between two earthen pots cloſely ſtopped, from whence the liquor runs through a ſmall wooden pipe. This liquor is more intoxicating than brandy diſtilled from wine.

Rack is alſo a ſpirituous liquor which the Engliſh get from Batavia or Malacca, of which there are three ſorts, the one being extracted from the cocoa-tree, the ſecond from rice, and the third from ſugar: but the firſt is the beſt and moſt in uſe. It is made of the bloſſom-bunch of the cocoa-tree: for which purpoſe they tie the bunch, while it is ſtill wrapped up within its cod, or membrane, with a piece of packthread; and then with a knife make a croſs cut in that bunch, a little above the place where it is tied, and adapt a pitcher to it to receive the liquor, which is called toddy, and is vinous, palatable, and ſweet: others uſe a bamboe-cane inſtead of a pitcher. Having thus drawn the liquor, they let it ferment, and afterwards diſtil it.

To RACK *wines*, &c. to draw them off from their lees, after their having ſtood long enough to clear and ſettle.

Hence rack-vintage is frequently uſed for the ſecond voyage our wine-merchants uſed to make into France for racked-wines.

RACKOON, in zoology. See VIVERRA.

RADIALIS, in anatomy. See ANATOMY, p. 198.

RADIANT, in optics, is any point of a viſible object from whence rays proceed. See OPTICS.

RADIATED FLOWERS, in botany, are ſuch as have ſeveral ſemi-floſcules ſet round a diſk, in form of a radiant ſtar; thoſe which have no ſuch rays are called diſcous flowers.

RADIATION, the act of a body emitting or diffuſing rays of light all round, as from a centre. See OPTICS.

RADICAL, in general, ſomething that ſerves as a baſis or foundation.

Hence phyſicians talk much of a radical moiſture.

In grammar, we give the appellation radical to primitive words, in contradiſtinction to compounds and derivatives.

Algebraiſts alſo ſpeak of the radical ſign of quantities, which is the character expreſſing their roots.

RADICLE, that part of the ſeeds of all plants, which upon vegetating becomes its root, and is diſcoverable by the microſcope. See AGRICULTURE, p. 41.

RADISH, in botany. See RAPHANUS.

RADIUS, in geometry, the ſemi diameter of a circle, or a right line drawn from the centre to the circumference.

RADIUS, in anatomy. See ANATOMY, p. 179.

RADIX. See ROOT.

RADNOR, the capital of the county of Radnor in Wales, ſituated in W. long. 3° 6′, N. lat. 52° 20′.

RAFTERS, in building, are pieces of timber, which ſtanding by pairs on the raiſon or raiſing piece, meet in an angle at the top, and form the roof of a building. See ARCHITECTURE.

RAGOUT, a ſauce, or ſeaſoning, intended to rouſe the appetite when loſt or languiſhing.

RAGULED, or RAGGED, in heraldry, jagged or knotted. This term is applied to a croſs formed of the trunks of two trees without their branches, of which they ſhew only the ſtumps. See Plate CXLVII fig. 5.

Raguled differs from indented, in that the latter is regular, the former not.

RAJA, the title of the Indian black princes, the remains of thoſe who ruled there before the Moguls. Some of the rajas are ſaid to preſerve their independency, eſpecially in the mountainous parts; but moſt of them pay an annual tribute to the Mogul.

RAJA, in ichthyology, a genus belonging to the order of amphibia nantes. There are five ſpiracula below towards the peak; the body is compreſſed; and the mouth is ſituate under the head. There are nine ſpecies, one of which is the torpedo, or cramp-fiſh, found in the Mediterranean and Perſian Gulph. When touched, it defends itſelf by a tremulous motion, which benumbs any animal which attempts to injure it.

RAJANIA, in botany, a genus of the diœcia hexandria claſs. The calix of both male and female conſiſts of ſix ſegments; none of them have any corolla; the female has three ſtyli; the fruit is roundiſh, with an oblique wing. There are three ſpecies, none of them natives of Britain.

RAIL, in ornithology. See RALLUS.

RAIN, water which deſcends from the clouds in form of drops of water.

Rain is apparently the precipitated vapours of watery clouds: thus, when various congeries of clouds are driven together by the agitation of the winds, they mix and run into one body, and by that means diſſolve and condenſe each other into their former ſubſtance of water: alſo the coldneſs of the air is a great means to collect, compact, and condenſe clouds into water; which being heavier than the air, muſt of neceſſity fall through it in the form we call rain. Now the reaſon why it falls in drops, and not in whole quantities, as it becomes condenſed, is the reſiſtance of the air; whereby being broken, and divided into ſmaller and ſmaller parts the farther it paſſes through the air, it at laſt arrives to us in ſmall drops.

Mr.

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Mr. Derham accounts for the precipitation hence, that the veſiculæ being full of air, when they meet with a colder air than that they contain, their air is contracted into a leſs ſpace; and conſequently the watery ſhell rendered thicker, ſo as to become heavier than the air, *&c.*

Others only allow the cold a part in the action, and bring in the winds as ſharers with it: indeed, it is plain, that a wind, blowing againſt a cloud, will drive its veſiculæ upon one another, by which means ſeveral of them coalleſcing, will be enabled to deſcend; and the effect will be ſtill more conſiderable if two oppoſite winds blow towards the ſame place. Add to this, that clouds already formed, happening to be aggravated by freſh acceſſions of vapour continually aſcending, may thence be enabled to deſcend.

According to Rohault, the great cauſe of rain is the heat of the air; which, after continuing for ſome time near the earth, is at length carried up on high by a wind, and there thawing the ſnowy villi, or flocks of the half frozen veſiculæ, reduces them into drops; which, coalleſcing, deſcend.

Others, as Dr. Clarke, *&c.* aſcribe this deſcent of the clouds rather to an alteration of the atmoſphere than of the veſiculæ; and ſuppoſe it to ariſe from a diminution of the elaſtic force of the air. This elaſticity, which depends chiefly or wholly on the terrene exhalations, being weakened, the atmoſphere ſinks under its burden, and the clouds fall.

Now the little veſicles, being once upon the deſcent, will perſiſt therein, notwithſtanding the increaſe of reſiſtance they every moment meet with. For as they all tend toward the centre of the earth, the farther they fall, the more coalitions will they make; and the more coalitions, the more matter will there be under the ſame ſurface; the ſurface only increaſing as the ſquares, but the ſolidity as the cubes; and the more matter under the ſame ſurface, the leſs reſiſtance there will be to the ſame matter. Thus, if the cold, wind, *&c.* act early enough to precipitate the aſcending veſicles, before they are arrived at any conſiderable height, the coalitions being but few, the drops will be proportionably ſmall; and thus is formed a dew. If the vapours be more copious, and riſe a little higher, we have a miſt or fog. A little higher ſtill, and they produce a ſmall rain, *&c.* If they neither meet with cold nor wind, they form a heavy, thick, dark ſky.

Hence, many of the phænomena of the weather may be accounted for: as, why a cold ſummer is always a wet one, and a warm a dry one; why we have commonly moſt rain about the equinoxes; why a ſettled, thick, cloſe ſky ſcarce ever rains, till it have been firſt clear. As to the quantity of rain that falls, its proportion in ſeveral places at the ſame time, and in the ſame place at ſeveral times, we have ſtore of obſervations, journals, *&c.* in the memoirs of the French Academy, Philoſophical Tranſactions, *&c.*

RAIN-BOW. See OPTICS, p. 435, *&c.*

Lunar RAINBOW. The moon ſometimes alſo exhibits the phænomenon of an iris, by the refraction of her rays in drops of rain in the night-time.

Ariſtotle ſays, he was the firſt that ever obſerved it; and adds, that it is never viſible but at the time of full moon.

The lunar iris has all the colours of the ſolar, only fainter.

Marine RAINBOW, the ſea-bow, is a phænomenon ſometimes obſerved in a much agitated ſea, when the wind, ſweeping part of the tops of the waves, carries them aloft; ſo that the rays of the ſun are refracted, *&c.* as in a common ſhower.

RAISINS, grapes prepared by ſuffering them to remain on the vine till they are perfectly ripe, and then drying them in the ſun, or by the heat of an oven. The difference between raiſins dried in the ſun, and thoſe dried in ovens, is very obvious: the former are ſweet and pleaſant, but the latter have a latent acidity with the ſweetneſs that renders them much leſs agreeable.

RAKE *of a ſhip* is all that part of her hull which hangs over both ends of her keel. That which is before, is called the fore-rake, or rake-forward; and that part which is at the ſetting on of the ſtern-poſt, is called the rake aft, or afterward.

RALLUS, in ornithology, a genus belonging to the order of grallæ. The beak is thickeſt at the baſe, compreſſed, equal, acute, and ſomewhat ſharp on the back near the point; the noſtrils are oval; the feet have four toes, without any web; and the body is compreſſed. There are ten ſpecies, principally diſtinguiſhed by their colour.

RAM, in zoology. See OVIS.

RAM, in aſtronomy See ASTRONOMY.

Battering RAM, in antiquity, a military engine uſed to batter and beat down the walls of places beſieged.

The battering ram was of two ſorts; the one rude and plain, the other compound. The former ſeems to have been no more than a great beam which the ſoldiers bore on their arms and ſhoulders, and with one end of it by main force aſſailed the wall. The compound ram is thus deſcribed by Joſephus; it is a vaſt beam, like the maſt of a ſhip, ſtrengthened at one end with a head of iron, ſomething reſembling that of a ram, whence it took its name.

This was hung by the middle with ropes to another beam, which lay acroſs two poſts; and hanging thus equally balanced, it was by a great number of men drawn backwards and puſhed forwards, ſtriking the wall with its iron-head.

Plutarch informs us, that Marc Anthony, in the Parthian war, made uſe of a ram fourſcore feet long: and Vitruvius tells us, that they were ſometimes an hundred and ſix, and ſometimes an hundred and twenty feet in length; and to this perhaps the force and ſtrength of the engine was in a great meaſure owing. The ram was managed at one time by a whole century of ſoldiers; and they being ſpent, were ſeconded by another century, ſo that it played continually without any intermiſſion.

RAM'S HEAD, in a ſhip, is a great block belonging to the fore and main-halliards. It has three ſhivers in it, into which the halliards are put, and in a hole at the end of it are reeved the ties.

RAMADAN, a ſolemn ſeaſon of faſting among the Mahometans. See MAHOMETANISM.

RAMIFICATION, the production of boughs or branches, or of figures reſembling branches.

RAMMER, an inſtrument uſed for driving down ſtones or piles into the ground; or for beating the earth, in order to render it more ſolid for a foundation.

RAMMER *of a gun*, the gun-ſtick; a rod uſed in charging of a gun, to drive home the powder, as alſo the ſhot and the

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the wad, which keeps the ſhot from rolling out. See GUNNERY.

RAMPANT, in heraldry, a term applied to a lion, leopard, or other beaſt that ſtands on his hind-legs, and rears up his forefeet in the poſture of climbing, ſhewing only half his face, as one eye, *&c.* It is different from ſaliant, in which the beaſt ſeems ſpringing forward as if making a ſally. See Plate CXLVII fig. 6.

RAMPART, in fortification, is an elevation of earth round a place capable of reſiſting the cannon of an enemy; and formed into baſtions, curtins, *&c.* See FORTIFICATION.

RAMSEY, an iſland in the Iriſh channel, on the coaſt of Pembrokeſhire: W. long 5° 20′, N. lat. 51° 55′.

RAMUS, in general, denotes a branch of any thing, as of a tree, an artery, vein, *&c.*

RANA, the FROG, in zoology, a genus belonging to the claſs of amphibia reptilia. The body is naked, furniſhed with four feet, and without any tail. There are 17 ſpecies. Frogs undergo a very ſtrange metamorphoſis. When they firſt iſſue from the eggs, they appear in a roundiſh form, with a long tail, and are then denominated tadpolls. After continuing in this ſtate for ſeveral weeks, the tail begins to mortify and fall off gradually, the feet at the ſame time ſpringing as gradually out of the body, till they aſſume the complete form of frogs.

RANCHIERA, a port-town of Terra Firma, ſituated in W. long. 72°, N. lat. 11° 34′.

RANCID, denotes a fatty ſubſtance that is become rank or muſty, or has contracted an ill ſmell by being kept cloſe.

RANGE, in gunnery, the path of a bullet, or the line it deſcribes from the mouth of the piece to the point where it lodges. See GUNNERY.

RANGIFER, the RAIN-DEER. See CORVUS.

RANK, the order or place allotted a perſon, ſuitable to his quality or merit.

RANKING OF CREDITORS, in Scots law. See LAW, Tit. xix. 13.

RANSOM, a ſum of money paid for the redemption of a ſlave, or for the liberty of a priſoner of war. In our law-books, ranſom is alſo uſed for a ſum paid for the pardon of ſome great offence, and to obtain the offender's liberty.

RANULA, a tumour under the tongue, which like a ligature hinders a child from ſpeaking or ſucking.

RANUNCULUS, in botany, a genus of the polyandria polygynia claſs. The calix conſiſts of five leaves, and the corolla of five petals, with a melliferous pore in the claw of each; and the ſeeds are naked. There are 38 ſpecies, 11 of them natives of Britain.

RAOLCONDA, a city of the hither India, ſituated in the province of Golconda: E. long. 79°, N. lat. 17° 12′.

RAPACIOUS ANIMALS, are ſuch as live upon prey.

RAPE, in law, the having carnal knowledge of a woman by force and againſt her will. See LAW, Tit. xxxiii. 26.

RAPHANUS, in botany, a genus of the tetradynamia ſiliquoſa claſs. The calix is ſhut; the pod is cylindrical, and ſubarticulated; there are two melliferous glands between the ſhort ſtamina and the piſtillum, and as many between the long ſtamina and calix. There are three ſpecies, only one of them, *viz.* the raphoniſtrum, charlock, a native of Britain.

RAPHIDIA, in zoology, a genus of inſects belonging to the order of neuroptera. The head is depreſſed and horny; it has two teeth, four pappi, and three ſtemmata; the wings are deflected; the feelers are cylindrical, and of the length of the thorax; and the tail of the female is furniſhed with a lax bended briſtle. There are three ſpecies.

RAPIER, formerly ſignified a long old-faſhioned broad ſword, ſuch as thoſe worn by the common ſoldiers: but it now denotes a ſmall ſword, as contradiſtinguiſhed from a back-ſword.

RAPINE, in law, the taking away another's goods, *&c.* openly and by violence.

RAPPAHANOCK, a large navigable river which riſes in the mountains weſt of Virginia, and diſcharges itſelf into the bay of Cheſepeak.

RAPTURE, an ecſtaſy, or tranſport of mind. See ECSTASY.

RARE, in phyſics, ſtands oppoſed to denſe; and denotes a body that is very porous, whoſe parts are at a great diſtance from one another, and which contains but little matter under a large bulk.

RAREFACTION, in phyſics, the act whereby a body is rendered rare; that is, brought to poſſeſs more room, or appear under a larger bulk without acceſſion of any new matter.

RASEBURG, a port town of Sweden, in the province of Finland, and territory of Nyland, ſituated on the gulph of Finland: E. long. 23°, N. lat 60° 22′.

RASTAT, the name of two towns of Germany; one in the circle of Bavaria and archbiſhopric of Saltzburg, ſituated on the river Ens, thirty-five miles ſouth of the city Ens; another in the circle of Swabia and marquiſate of Baden, ſituated on the eaſt ſide of the river Rhine, twenty-one miles ſouth-weſt of Philipſburg.

RAT, in zoology. See MUS.

RAT-TAILS, or ARRESTS, in the manege, ſignify hard callous ſwellings upon the hinder legs under the hough, running along the ſinew.

A horſe is called rat-tail, when he has no hair upon his tail.

RATAFIA, a fine ſpirituous liquor, prepared from the kernels, *&c.* of ſeveral kinds of fruits, particularly of cherries and apricots.

Ratafia of cherries is prepared by bruiſing the cherries, and putting them into a veſſel wherein brandy has been long kept; then adding to them the kernels of cherries, with ſtraw-berries, ſugar, cinnamon, white pepper, nutmeg, cloves; and to twenty pound of cherries, ten quarts of brandy. The veſſel is left open ten or twelve days, and then ſtopped cloſe for two months before it be tapped. Ratafia of apricots is prepared two ways, *viz.* either by boiling the apricots in white wine, adding to the liquor an equal quantity of brandy, with ſugar, cinnamon, mace, and the kernels of apricots; infuſing the whole for eight or ten days; then ſtraining the liquor, and putting it up for uſe: Or elſe by infuſing the apricots cut in pieces in brandy, for a day or two, paſſing it through a ſtraining-bag, and then putting in the uſual ingredients.

RATCH, or RASH, in clock-work, a ſort of wheel having twelve fangs, which ſerve to lift up the detents every hour, and make the clock ſtrike. See WATCH.

RATCHETS, in a watch, are the ſmall teeth at the bot-

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tom of the fuſy, or barrel, which ſtops it in winding up.

RATE, a ſtandard or proportion, by which either the quantity or value of a thing is adjuſted.

RATE *of a ſhip of war*, is its order, degree, or diſtinction, as to magnitude, burden, *&c.*

RATEEN, in commerce, a thick woollen ſtuff, quilted, woven on a loom with four treddles, like ſerges, and other ſtuffs, that have the whale or quilling. There are ſome rateens dreſſed and prepared like cloths; others left ſimply in the hair; and others where the hair or knap is friz-d. Rateens are chiefly manufactured in France, Holland, and Italy, and are moſtly uſed in linings. The frize is a ſort of coarſe rateen, and the drugget is a rateen half linnen half woolen.

RATIFICATION, an act approving off, and confirming ſomething done by another in our name.

RATIO, in arithmetic and geometry, is that relation of homogeneous things which determines the quantity of one from the quantity of another, without the intervention of a third. See ARITHMETICK, ALGEBRA, and GEOMETRY.

RATIOCINATION, the act of reaſoning. See REASONING.

RATION, in the army, a portion of ammunition, bread, drink, and forage, diſtributed to each ſoldier in the army, for his daily ſubſiſtence, *&c.* The horſe have rations of hay and oats, when they cannot go out to forage. The rations of bread are regulated by weight. The ordinary ration of a foot-ſoldier is a pound and a half of bread per day. The officers have ſeveral rations according to their quality and the number of attendants that they are obliged to keep. When the ration is augmented on occaſions of rejoicing, it is called a double ration. The ſhips crews have alſo their rations or allowances of biſcuit, pulſe, and water, proportioned according to their ſtock.

RATIONAL, *reaſonable.* See REASON.

RATIONAL, is alſo applied to integral, fractional, and mixt numbers: thus we ſay rational fraction, rational integer, and rational mixt number.

RATIONALE, a ſolution or account of the principles of ſome opinion, action, hypotheſis, phænomenon, or the like.

RATIPOR, a town of Bohemia, in the duchy of Sileſia, ſituated on the river Oder, ſixteen miles north-eaſt of Tropaw.

RATIPOR, is alſo a city of hither India, capital of the province of Malva, ſituated E. long. 80°, N. lat. 25°.

RATISBON, a city of Germany, in the circle of Bavaria, ſituated at the confluence of the rivers Danube and Regen, in E. long. 12° 5′, N. lat. 49°. This is a free imperial city, and here the aſſembly or diet of the ſtates of the empire meets.

RATLINES, or, as the ſeamen call them, RATLINS, thoſe lines which make the ladder-ſteps to go up the ſhrouds and puttocks, hence called the ratlins of the ſhrouds.

RATTLE-SNAKE, See CROTALUS.

RATTLE-SNAKE-ROOT. See POLYGALA.

RAVA, a city of Great Poland, capital of the Palatinate of Rava, ſituated fifty miles ſouth-eaſt of Warſaw.

RAVELIN, in fortification, was anciently a flat baſtion, placed in the middle of a curtin; but now a detached work compoſed only of two faces, which make a ſaliant angle, without any flanks, and raiſed before the curtin on the counterſcarp of the place. See FORTIFICATION.

RAVEN, in ornithology. See CORVUS.

RAVENGLAS, a port-town of Cumberland, ſituated on the Iriſh Channel, thirty-eight miles ſouth-weſt of Carliſle.

RAVENNA, a city of Italy, in the pope's territories, capital of the province of Romania, ſituated E. lon. 13°, N. lat. 44° 30′.

RAUVOLFIA, in botany, a genus of the pentandria monogynia claſs. The berry contains two ſeeds. There are two ſpecies, both natives of America.

RAY, in optics, a beam of light, emitted from a radiant or luminous body. See OPTICS.

RAYLEIGH, a market-town of Eſſex, ten miles ſouth-eaſt of Chelmsford.

RAYONANT, or *Croſs* RAYONANT, in heraldry, one which has rays of glory behind it, darting out from the centre to all the quarters of the eſcutcheon, as repreſented in Plate CXLVII. fig. 7.

RAZOR, a well known inſtrument uſed by ſurgeons, barbers, *&c.* for ſhaving off the hair from various parts of the body.

RAZOR-BILL, in ornithology. See ALCA.

RE-ACTION, in phyſiology, the reſiſtance made by all bodies to the action or impulſe of others that endeavour to change its ſtate whether of motion or reſt. See MECHANICS.

READING, a borough-town in Berkſhire, ſituated forty miles weſt of London, near the confluence of the river Kenet and Thames; it ſends two members to parliament.

REAL, is applied to a being that actually exiſts; in which ſenſe, it coincides with actual.

REAL, or CHIAPA, a city of Mexico, in North America, capital of the province of Chiapa, ſituated W. lon. 97°, N. lat. 17°.

REALEIO, a port-town of Mexico, in the province of Nicaragua, ſituated on the bay of the Pacific Ocean, in W. long. 91° 30′, N. lat. 12°.

REALISTS, a ſect of ſchool philoſophers, formed in oppoſition to the nominaliſts. See NOMINALISTS.

Under the Realiſts are included the Scotiſts, Thomiſts, and all excepting the followers of Ocham. Their diſtinguiſhing tenet is, that univerſals are realities, and have an actual exiſtence out of an idea or imagination, or, as they expreſs it in the ſchools, *a parte rei*; whereas the nominaliſts contend, that they exiſt only in the mind, and are only ideas, or manners of conceiving things.

REALITY, in the ſchools, a diminutive of *res*, thing, firſt uſed by the Scotiſts, to denote a thing which may exiſt of itſelf; or which has a full and abſolute being of itſelf, and is not conſidered as a part of any other.

REALM, a country which gives its head, or governor, the denomination of a king.

REALMONT, a town of France, in the province of Languedoc, ſituated thirty-two miles north-eaſt of Thouloſe.

REAR, a term frequently uſed in compoſition, to denote ſomething behind, or backwards, in reſpect of another, in oppoſition to van: thus, in a military ſenſe, it is uſed for the hind part of an army, in oppoſition to the front.

REASON, a faculty or power of the mind, whereby it diſtin-

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diſtinguiſhes good from evil, truth from falſehood, &c. See LOGIC and METAPHYSICS.

REASONING, RATIOCINATION, the exerciſe of the faculty of the mind called reaſon; or it is an act or operation of the mind, deducing ſome unknown propoſition from other previous ones that are evident and known. See LOGIC, and METAPHYSICS.

REBATE, or REBATEMENT, in commerce, a term much uſed at Amſterdam, for an abatement in the price of ſeveral commodities, when the buyer inſtead of taking time advances ready money.

REBATEMENT, in heraldry, a diminution or abatement of the bearings in a coat of arms.

REBEL, a town of Germany, in the duchy of Mecklenburgh, thirty-two miles ſouth-eaſt of Guſtrow.

REBELLION, a traiterous taking up of arms againſt the king by his own natural ſubjects, or thoſe formerly ſubdued.

REBUS, in ænigmatical repreſentation of ſome name, &c. by uſing figures or pictures inſtead of words, or parts of words. Camden mentions an inſtance of this abſurd kind of wit in a gallant, who expreſſed his love to a woman, named Roſe Hill, by painting in the border of his gown a *roſe*, a *hill*, an *eye*, a *loaf*, and a *well*; which, in the ſtyle of the rebus, reads, *Roſe Hill, I love well*. This kind of wit was long practiſed by the great, who took the pains to find devices for their names. It was, however, happily ridiculed by Ben Johnſon, in the humourous deſcription of Abel Drugger's device, in the Alchemiſt; and by the Spectator, in the device of Jack of Newberry; at which time the rebus, being raiſed to ſign-poſts, was grown out of faſhion at court.

REBUTTER, in law, the defendant's anſwer to the plaintiff's ſurrejoinder, in a cauſe depending in the court of chancery, &c

RECAPITULATION, is a ſummary, or a conciſe and tranſient enumeration of the principal things inſiſted on in the preceding diſcourſe, whereby the force of the whole is collected into one view.

RECEIVER, in pneumatics, a glaſs-veſſel for containing the thing on which an experiment in the air-pump is to be made. See PNEUMATICS.

RECEPTACULUM CHYLI. See ANATOMY, p. 282.

RECHABITES, a kind of religious order among the ancient Jews, inſtituted by Jonadab the ſon of Rechab, comprehending only his own family and poſterity.

Their founder preſcribed them three things: firſt, not to drink any wine; ſecondly, not to build any houſes, but to dwell in tents; and thirdly, not to ſow any corn, or plant vines. Theſe rules the Rechabites obſerved with great ſtrictneſs,

RECIPE, in medicine, a preſcription or remedy, to be taken by a patient; ſo called becauſe always beginning with the word *recipe*, i. e. *take*; which is generally denoted by the abbreviature ℞.

RECIPIENT, the ſame with receiver.

RECIPROCAL, in general, ſomething that is mutual, or which is returned equally on both ſides, or that affects both parties alike.

RECIPROCAL TERMS, among logicians, are thoſe which have the ſame ſignification; and conſequently are convertible, or may be uſed for each other.

RECIPROCAL FIGURES, in geometry, thoſe which have the antecedents and conſequents of the ſame ratio in both figures. See GEOMETRY.

RECITATIVO, in muſick, a kind of ſinging that differs but little from ordinary pronunciation, ſuch as that in which the ſeveral parts of the liturgy are rehearſed in cathedrals; or that wherein the actors commonly deliver themſelves on the theatre at the opera, when they are to expreſs ſome action or paſſion, to relate ſome event, or reveal ſome deſign.

RECKONING, or *a ſhip's* RECKONING. See NAVIGATION.

RECLINATION of a plane, in dialling, the number of degrees which a dial-plane leans backwards from an exactly upright or vertical plane, that is, from the zenith. See DIALLING.

RECLUSE, among the Papiſts, a perſon ſhut up in a ſmall cell of an hermitage, or monaſtery, and cut off, not only from all converſation with the world, but even with the houſe This is a kind of voluntary impriſonment, from a motive either of devotion or penance.

RECOLLECTION, a mode of thinking, by which ideas ſought after by the mind, are found, and brought again to view.

RECONNOITRE, in war, to view and examine the ſtate and ſituation of things.

RECORD, an authentic teſtimony in writing, contained in rolls of parchment, and preſerved in a court of record.

RECORDER, a perſon whom the mayor and other magiſtrates of a city or corporation aſſociate to them, for their better direction in matters of juſtice, and proceedings in law; on which account this perſon is generally a counſellor, or other perſon well ſkilled in the law.

The recorder of London is choſen by the lord mayor and aldermen; and, as he is held to be the mouth of the city, he delivers the judgment of the courts therein, and records and certifies the city-cuſtoms.

RECOURSE ON BILLS, in Scots law. See LAW, Tit. xxi. 12.

RECREMENT, in chemiſtry, ſome ſuperfluous matter ſeparated from ſome other that is uſeful: in which ſenſe it is the ſame with ſcoriæ, fæces, and excrements. See CHEMISTRY.

RECRIMINATION, in law, an accuſation brought by the accuſed againſt the accuſer upon the ſame fact.

RECRUITS, in military affairs, new-raiſed ſoldiers, deſigned to ſupply the place of thoſe who have loſt their lives in the ſervice, or are diſabled by age or wounds.

RECTANGLE, in geometry, the ſame with a right-angled parallelogram. See GEOMETRY.

RECTIFICATION, in chemiſtry, is nothing but the repetition of a diſtillation or ſublimation ſeveral times, in order to render the ſubſtance purer, finer, and freer from aqueous or earthy parts.

RECTIFIER, in navigation, an inſtrument conſiſting of two parts, which are two circles either laid one upon, or let into, the other, and ſo faſtened together in their centres, that they repreſent two compaſſes, one fixed, the other moveable; each of them divided into the thirty-two points of the compaſs, and three hundred and ſixty degrees, and numbered both ways, from the north and the ſouth, ending at the eaſt and weſt, in ninety degrees.

The fixed compaſs repreſents the horizon, in which thee

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the north and all the other points of the compaſs are fixed and immoveable.

The moveable compaſs repreſents the mariners compaſs, in which the north and all other points are liable to variation.

In the centre of the moveable compaſs is faſtened a ſilk thread, long enough to reach the outſide of the fixed compaſs. But, if the inſtrument be made of wood, there is an index inſtead of the thread.

Its uſe is to find the variation of the compaſs, to rectify the courſe at ſea; having the amplitude or azimuth given.

RECTIFIER, in the diſtillery, the perſon whoſe employment it is to take the coarſe malt-ſpirit of the malt-ſtiller, and rediſtil it to a finer and better liquor.

RECTILINEAR, in geometry, right-lined: thus figures whoſe perimeter conſiſts of right lines, are ſaid to be rectilinear.

RECTITUDE, in philoſophy, refers either to the act of judging or of willing: and therefore whatever comes under the denomination of rectitude is either what is true, or what is good; theſe being the only objects about which the mind exerciſes its two faculties of judging and willing.

Moral rectitude, or uprightneſs, is the chuſing and purſuing thoſe things which the mind, upon due inquiry and attention, clearly perceives to be good; and avoiding thoſe that are evil.

RECTOR, a term applied to ſeveral perſons whoſe offices are very different: as, 1. The rector of a pariſh is a clergyman that has the charge and cure of a pariſh, and poſſeſſes all the tythes, *&c.* 2. The ſame name is alſo given to the chief elective officer in ſeveral foreign univerſities, particularly in that of Paris. 3. Rector is alſo uſed in ſeveral convents for the ſuperior officer who governs the houſe: and the Jeſuits give this name to the ſuperiors of ſuch of their houſes as are either ſeminaries or colleges.

RECTORY, a pariſh-church, parſonage, or ſpiritual living, with all its rights, tythes, and glebes.

RECTUM, in anatomy, the third and laſt of the large inteſtines or guts. See ANATOMY, p. 261.

RECTUS, in anatomy, a name common to ſeveral pair of muſcles, ſo called on account of the ſtraightneſs of their fibres See ANATOMY, Part II.

RECURRENTS, in anatomy, a name given to ſeveral large branches of nerves ſent out by the par vagum from the upper part of the thorax to the larynx.

RECURVIROSTRA, in ornithology, a genus belonging to the order of grallæ. The beak is ſubulated, bent back, ſharp and flexible at the point; the feet are webbed, and furniſhed with three toes. There is but one ſpecies, *viz.* the avocetta, a native of the ſouthern parts of Europe. It migrates into Italy, but ſeldom to the north.

RECUSANTS, ſuch perſons as acknowledge the pope to be the ſupreme head of the church, and refuſe to acknowledge the king's ſupremacy; who are hence called popiſh recuſants. Theſe are in England charged with double taxes, not merely as Romaniſts but as recuſants.

RED, one of the ſimple or primary colours of natural bodies, or rather of the rays of light. See OPTICS.

RED, in dying, is one of the five ſimple or mother colours. Some reckon ſix kinds or caſts of red, *viz.* ſcarlet red, crimſon red, madder red, half-grain red, lively orange red, and ſcarlet of cochineal: but they may be all reduced to the three following, according to the three principal drugs which give the colours, *viz.* the kermes, cochineal, and madder.

RED, in heraldry. See GULES.

RED RUSSIA, or LITTLE RUSSIA, a province of Poland, bounded by the province of Poleſia, on the north; by Volhinia and Podolia on the eaſt; by the Carpathian mountains, which divide it from Tranſilvania and Hungary, on the ſouth; and by the province of Little Poland, on the weſt; being two hundred miles long, and one hundred broad.

RED-SEA ſeparates Aſia from Africa.

REDDLE, a ſoft, heavy, red marle, of great uſe in colouring; and being waſhed and freed from its ſand, is often ſold by our druggiſts under the name of bole-armenic

REDEMPTION, in law, a faculty or right of re-entering upon lands, *&c* that have been ſold and aſſigned, upon reimburſing the purchaſe-money with legal coaſts.

REDENS, in fortification, a kind of work indented in form of the teeth of a ſaw, with ſaliant and re-entering angles, to the end that one part may flank or defend another. It is called ſaw-work and indented-work.

REDINTEGRATION, in the civil law, the act of reſtoring a perſon to the enjoyment of a thing whereof he had been illegally diſpoſſeſſed.

REDOUBT, in fortification, a ſmall ſquare fort, without any defence but in front, uſed in trenches, lines of circumvallation, contravallation, and approach; as alſo for the lodgings of corps de gard, and to defend paſſages.

REDRESSING, the rectifying or ſetting any thing ſtraight again.

In a moral ſenſe, to redreſs grievances is to reform and remove them.

To redreſs a ſtag, among hunters, is to put him off his changes.

REDRUTH, a market-town of Cornwall, ſituated fifty miles ſouth-weſt of Launceſton.

REDUBBORS, thoſe who buy ſtolen cloaths, *&c.* and, to the end they may not be known, convert them into ſome other form, or change the colour, *&c.*

REDUCTION, in the ſchools, a manner of bringing a term or propoſition, which was before oppoſite to ſome other, to be equivalent to it.

REDUCTION, in arithmetick. See ARITHMETICK, p. 380.

REDUCTION, in ſurgery, denotes an operation whereby a diſlocated, luxated, or fractured bone is reſtored to its former ſtate or place.

REDUCTION, in Scots law. See LAW, Tit. XXX. 3.

REDUNDANCY, a fault in diſcourſe, conſiſting in the uſe of a ſuperfluity of words. Words perfectly tynonymous are redundant, and ought to be retrenched.

REED, in botany. See ARUNDO.

REEF, a term in navigation. When there is a great gale of wind, they commonly roll up part of the ſail below, that by this means it may become the narrower, and not draw ſo much wind; which contracting or taking up the ſail, they call a reef, or reefing the ſail: ſo alſo when a top-maſt is ſprung, as they call it, that is, when it is cracked, or almoſt broken in the cap, they cut off the lower piece that was near broken off, and ſetting the other part,

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part, now much ſhorter, in the ſtep again, they call it a reefed top-maſt.

REEL, in the manufactories, a machine ſerving for the office of reeling. There are various kinds of reels, ſome very ſimple, others very complex.

REELING, in the manufactories, the winding of thread, ſilk, cotton, or the like, into a ſkain, or upon a bottom, to prevent its entangling. It is alſo uſed for the charging or diſcharging of bobbins or quills, to uſe them in the manufacture of different ſtuffs, as thread, ſilk, cotton, *&c.* Reeling is performed different ways, and on different engines.

REEVING, in the ſea language, the putting a rope through a block: hence to pull a rope out of a block, is called unreeving.

RE-EXCHANGE, in commerce, a ſecond payment of the price of exchange, or rather the price of a new exchange due upon a bill of exchange that comes to be proteſted and to be refunded the bearer by the drawer or indorſer.

REFECTION, among eccleſiaſtics, a ſpare meal or repaſt, juſt ſufficing for the ſupport of life: hence the hall in convents, and other communities, where the monks, nuns, *&c.* take their refections or meals in common, is called the refectory.

REFERENCE, in writing, *&c.* a mark relative to another ſimilar one in the margin, or at the bottom of the page, where ſomething omitted in the text is added, and which is to be inſerted either in reading or copying.

REFINING, in general, is the art of purifying a thing; including not only the aſſaying or refining of metals, but likewiſe the clarification of liquors.

REFINING *of gold.* See CHEMISTRY, p. 129.

REFINING *of ſilver.* See CHEMISTRY, p. 130.

REFLECTION, the return or regreſſive motion of a moving body, occaſioned by ſome obſtacle which hindered it from purſuing its former direction.

REFLECTION *of the rays of light.* See OPTICS.

REFLECTION is alſo uſed, figuratively, for an operation of the mind; whereby it turns its view backwards as it were upon itſelf, and makes itſelf and its own operation the object of its diſquiſition; and by contemplating the manner, order, and laws which it obſerves in perceiving ideas, comparing them together, reaſoning, *&c.* it frames new ideas of the relations diſcovered therein. See LOGIC, and METAPHYSICS.

REFLUX *of the ſea*, the ebbing of the water, or its returning from the ſhore. See ASTRONOMY, p. 473.

REFORMATION, the act of reforming or correcting an error or abuſe in religion, diſcipline, or the like.

The Reformation, ſo called by way of eminence, is the ſeparation of the Proteſtants from the church of Rome, in the beginning and towards the middle of the ſixteenth century.

REFRACTION, in general, is the deviation of a moving body from its direct courſe, occaſioned by the different denſity of the medium it moves in; or, it is a change of direction, occaſioned by a body's falling obliquely out of one medium into another of a different denſity. See OPTICS.

REFRANGIBILITY *of light*, the diſpoſition of rays to be refracted. See OPTICS

REFRIGERATIVE, in medicine, a remedy which refreſhes the inward parts, by cooling them, as clyſters, ptiſans, *&c.*

REFRIGERATORY, in chemiſtry, a veſſel filled with cold water, through which the worm paſſes in diſtillations; the uſe of which is, to condenſe the vapours as they paſs through the worm.

REFUGE, a ſanctuary or aſylum.

REFUGEES, French Proteſtants; who, by the revocation of the edict of Nantz, have been conſtrained to fly from perſecution, and take refuge in foreign countries.

REGAL or ROYAL, ſomething belonging to a king.

REGALE, a magnificent entertainment or treat given to ambaſſadors, and other perſons of diſtinction, to entertain or do them honour.

It is uſual, in Italy, at the arrival of a traveller of eminence, to ſend him a regale, that is, a preſent of ſweetmeats, fruit, *&c.* by way of refreſhment.

REGALE, in the French juriſprudence, is a royal prerogative, which conſiſts in enjoying the revenues of biſhoprics during the vacancy of their ſees, of preſenting to benefices, and of obliging the new biſhop to take an oath of fidelity, and to regiſter it in the chamber of accounts. The enjoyment of the fruits of the ſee is called the temporal regale; and that of preſenting to the ſee, the ſpiritual regale.

REGALIA, in law, the rights and prerogatives of a king; which, according to civilians, are ſix: *viz.* 1 The power of judicature: 2. The power of life and death: 3. The power of peace and war: 4. A right to ſuch goods as have no owner, as waiſs, eſtrays, *&c.* 5. Aſſeſſments: and, 6. The coinage of money.

Regalia is alſo uſed for the apparatus of a coronation, as the crown, the ſceptre with the croſs, that with the dove, St. Edward's ſtaff, the globe, and the orb with the croſs, four ſeveral ſwords, *&c.*

REGALIA, in Scots law. See LAW, Tit. xiii. 3.

Lord of REGALITY, in Scots law. See LAW, Tit. iv. 4.

REGARDANT, in heraldry, ſignifies looking behind; and is uſed for a lion, or other beaſt, with his face turned towards his tail.

REGARDER, an ancient officer of the king's foreſt, ſworn to make the regard of the foreſt every year; that is, to take a view of its limits, to inquire into all offences and defaults committed by the foreſters within the foreſt, and to obſerve whether all the other officers executed their reſpective duties.

REGEL, or RIGEL, a fixed ſtar of the firſt magnitude, in Orion's left foot.

REGENERATION, in theology, the act of being born again by a ſpiritual birth, or the change of heart and life experienced by a perſon who forſakes a courſe of vice, and ſincerely embraces a life of virtue and piety.

REGENT, one who governs a kingdom during the minority or abſence of the king.

In France, the queen-mother has the regency of the kingdom during the minority of the king, under the title of queen-regent.

REGENT alſo ſignifies a profeſſor of arts and ſciences in a college, who has a ſet of pupils under his care; but here regent is generally reſtrained to the lower claſſes, as regent of rhetoric, regent of logic, *&c.* thoſe of philoſophy are rather called profeſſors.

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REGICIDE, KING-KILLER, a word chiefly uſed with us in ſpeaking of the perſons concerned in the trial, condemnation, and execution of king Charles I.

REGIFUGE, a feaſt celebrated in ancient Rome on the ſixth of the kalends of March, in memory of the expulſion of their ancient kings, and particularly of Tarquin's flying out of Rome on that day.

REGIMEN, the regulation of diet, and, in a more general ſenſe, of all the non-naturals, with a view to preſerve or reſtore health. See MEDICINE.

REGIMEN, in grammar, that part of ſyntax, or conſtruction, which regulates the dependency of words, and the alterations which one occaſions in another. See GRAMMAR

REGIMENT, in war, is a body of men, either horſe or foot, commanded by a colonel.

Each regiment of foot is divided into companies; but the number of companies is not always alike; though our regiments generally conſiſt of thirteen companies, one of which is always grenadiers.

Regiments of horſe moſt commonly conſiſt of ſix troops, but ſome have nine.

Regiments of dragoons, in time of war, are generally compoſed of eight troops; and in time of peace, of ſix.

REGION, in geography, a large extent of land, inhabited by many people of the ſame nation, and incloſed within certain limits or bounds.

REGISTER, a public book in which is entered and recorded memoirs, acts, and minutes, to be had recourſe to occaſionally, for knowing and proving matters of fact.

REGISTER SHIPS, in commerce, are veſſels which obtain a permiſſion either from the king of Spain, or the council of the Indies, to traffic in the ports of the Spaniſh Weſt-Indies; which are thus called, from their being regiſtered before they ſet ſail from Cadiz, for Buenos Ayres.

REGISTERS, in chemiſtry, are holes, or chinks with ſtopples, contrived in the ſides of furnaces, to regulate the fire; that is, to make the heat more intenſe, or remiſs, by opening them to let in the air, or keeping them cloſe to exclude it.

REGISTRY, the office, books, and rolls, in which the proceedings in chancery, or any ſpiritual court, are regiſtered.

REGRATOR, or REGRATER, in law, formerly ſignified one who bought wholeſale, or by the great, and ſold again by retail: but the term is now uſed for one who buys any wares or victuals, and ſells them again in the ſame market, or fair, or within fifteen miles round it. See FORESTALLING.

REGULAR, denotes any thing that is agreeable to the rules of art: thus, we ſay a regular building, verb, *&c.*

A regular figure, in geometry, is one whoſe ſides, and conſequently angles, are equal; and a regular figure with three or four ſides, is commonly termed an equilateral triangle, or ſquare, as all others with more ſides are called regular polygons.

REGULAR, in a monaſtery, a perſon who has taken the vows; becauſe he is bound to obſerve the rules of the order he has embraced.

REGULATION, a rule or order preſcribed by a ſuperior, for the proper management of ſome affair.

REGULATOR *of a watch*, the ſmall ſpring belonging to the balance; ſerving to adjuſt its motions, and make it go faſter or ſlower. See WATCH.

REGULUS, in ornithology. See MOTACILLA.

REGULUS, in chemiſtry, an imperfect metallic ſubſtance, that falls to the bottom of the crucible, in the melting of ores or impure metallic ſubſtances. See CHEMISTRY, *paſſim*.

REHABILITATION, in the civil and the canon law, the reſtoring a delinquent to his former condition.

REHEARSAL, in muſick and the drama, an eſſay or experiment of ſome compoſition, generally made in private, previous to its repreſentation or performance in public, in order to render the actors and performers more perfect in their parts.

REIN-DEER, in zoology. See CERVUS.

REINS, in anatomy. See ANATOMY, p. 268.

REJOINDER, in law, is the defendant's anſwer to the plaintiff's replication or reply. Thus, in the court of chancery, the defendant puts in an anſwer to the plaintiff's bill, which is ſometimes alſo called an exception; the plaintiff's anſwer to this is called a replication; and the defendant's anſwer to that a rejoinder.

REITERATION, the act of repeating a thing, or doing it a ſecond time.

RELAPSE, a falling again into a danger, evil, or diſeaſe, from which a perſon has eſcaped.

RELATION, the mutual reſpect of two things, or what each is with regard to the other. See METAPHYSICS.

RELATION, in geometry. See RATIO.

RELATION is alſo uſed for analogy. See ANALOGY.

RELATIVE, ſomething relating to, or reſpecting, another.

RELATIVE TERMS, in logic, are words which imply a relation: ſuch are maſter and ſervant, huſband and wife, *&c.*

RELAXATION, in medicine, *&c.* the act of looſening or ſlackening, or the looſeneſs and ſlackneſs of the fibres, nerves, muſcles, *&c.*

RELAY, a ſupply of horſes placed on the road, and appointed to be ready for a traveller to change, in order to make the greater expedition.

RELEVANCY, in Scots law. See LAW, Tit. xxxiii. 48.

RELICS, in the Romiſh church, the remains of the bodies of ſaints or martyrs, and the inſtruments by which they were put to death, devoutly preſerved, in honour to their memory; kiſſed, revered, and carried in proceſſion.

RELICT, in law, the ſame with widow.

RELIEVO, or RELIEF, in ſculpture, *&c.* is the projecture or ſtanding out of a figure; which ariſes prominent from the ground or plan on which it is formed: whether that figure be cut with the chiſſel, moulded, or caſt.

There are three kinds or degrees of relievo, *viz.* alto, baſſo, and demi relievo. The alto-relievo, called alſo haut-relief, or high relievo, is when the figure is formed after nature, and projects as much as the life. Baſſo-relievo, baſs-relief, or low relievo, is when the work is raiſed but a little from the ground, as in medals, and the frontiſpieces of buildings; and particularly in the hiſtories, feſtoons, foliages, and other ornaments of friezes. Demi-relievo is when one half of the figure riſes from the plan.

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When, in a baſſo-relievo, there are parts that ſtand clear out, detached from the reſt, the work is called a demi-baſſo.

RELIEVO, or RELIEF, in painting, is the degree of boldneſs with which the figures ſeem, at a due diſtance, to ſtand out from the ground of the painting.

RELIGION, or THEOLOGY.

I. TO know God, and to render him a reaſonable ſervice, are the two principal objects of religion. We know but little of the nature of bodies; we diſcover ſome of their properties, as motion, figure, colours, *&c.* but of their eſſence we are ignorant: we know ſtill much leſs of the ſoul; but of the eſſence or nature of God, we know nothing: it is the prerogative of the Supreme Being alone to comprehend his own eſſence: all the efforts that we can make to attain that knowledge, are arrogant and ineffectual; it is foreign to the nature of a limited ſpirit: but our deſtiny is that of a man, and our deſires are thoſe of a God. In a word, man appears to be formed to adore, but not to comprehend, the Supreme Being.

II. We may ſay, however, with Virgil, *Jovis omnia plena*; God manifeſts his exiſtence, not only to the internal ſenſations of our minds, but in every object that ſurrounds us in the whole frame of nature; and if we cannot comprehend the Supreme Being by our ſenſes, we may diſcover his attributes by our reaſon, almoſt as clearly as we diſtinguiſh the properties of matter, and many other objects: and this knowledge is ſufficient for us. The end of every other ſcience is ſome temporal happineſs; theology alone propoſes an eternal felicity; its object therefore differs from all other ſciences, as the age of threeſcore and ten differs from eternity. We cannot wonder therefore, that all the inhabitants of the earth, from the time of the creation, have made it their principal ſtudy, and have exerted all their abilities in the cultivation of it: we ought much rather to be aſtoniſhed that it does not yet more ſtrongly engage the attention of mankind; and that while they labour ſo aſſiduouſly to acquire thoſe ſciences, whoſe utility extends to ſo ſhort a ſpace of time, they ſhould ſo frequently neglect that object which can ſecure their felicity in a future, certain, and eternal exiſtence.

III. From the firſt knowledge that we have of the world, that is to ſay, for about five thouſand years paſt, men have blindly ſearched after the idea of the true God; and by the weakneſs of their diſcernment, they have fallen into a thouſand errors. Paganiſm at firſt covered the whole earth, except that family alone which became the ſtock of the Jewiſh people: this paganiſm among different nations had different mixtures of idolatry. Moſes firſt made known to the Hebrews the true God, and preſcribed them his worſhip: his religion, however, was not adopted by any other people, not even by their neighbours. Jeſus Chriſt appeared upon the earth, aboliſhed a part of the Judaic law, reformed the religion of Moſes, taught his divine doctrines, and offered himſelf as a ſacrifice for the ſalvation of mankind. His goſpel made a happy progreſs over all Europe, that is, over the then known part of the earth. Some time after, Mahomet aroſe in the eaſt and preached a religion that he had compounded of the Jewiſh and Chriſtian, and of his own ideas. Laſtly, came Luther and Calvin, who reformed the errors which, according to them, had been introduced into Chriſtianity under the reigns of the popes; and gave the idea of what is called the Proteſtant Religion. Confucius had taught the Chineſe, and Zoroaſter the Indians, religions drawn partly from philoſophy, and partly from paganiſm; but the extent of theſe was very confined. All theſe religions, and their different ſects, have had their theology, their prieſts, their ceremonies, their triumphs, and even their martyrs.

IV. We ſhall not ſpeak here of religions that are extinct, or that yet exiſt, but at a diſtance far from us: we ſhall treat only of the Chriſtian theology, which teaches us to know God, by revelation and by the light of reaſon, ſo far as it is poſſible for the weakneſs of the human mind to comprehend that inſcrutable Being. The knowledge of the true God is indeed of little utility to man, unleſs he can ſuppoſe that there is ſome connection or relation between that Supreme Being and himſelf. Now it is from theſe connections or relations that are derived the neceſſity of the knowledge of the true God, and of the true manner in which he is to be worſhipped: and this it is that forms the Chriſtian theology; of which we ſhall now give the analyſis.

V. To aſcend by a chain of reaſoning from things viſible to things inviſible, from palpable to impalpable, from terreſtrial to celeſtial, from the creature even up to the Creator, is the buſineſs of theology: it is not ſurpriſing, therefore, that the union of many doctrines is neceſſary completely to form ſuch a ſcience. To underſtand, and properly to interpret the ſcriptures or revelation, demands not leſs ſagacity than aſſiduity. The gift of perſuaſion is alſo eſſential to the miniſters of the goſpel. And laſtly, the civil government has committed to their care certain functions of ſociety, which relate, or ſeem to relate, either to the doctrines or morality of the goſpel. They aſſemble, for example, in bodies to form conſiſtories; they judge in matrimonial caſes; they carry conſolation and hope to the ſouls of the ſick; they prepare for death thoſe criminals which juſtice ſacrifices to public ſafety; they take upon themſelves the charge of *Ephori*, with the inſpection of ſome pious foundations; they diſtribute alms; they adminiſter the ſacraments, *&c.*

VI. To diſcharge fully ſo many duties, the theologian has need, 1. Of ſeveral preparatory ſtudies: 2. Of ſome theoretic ſciences; and, 3. Of many doctrines which have for their object his miniſterial office. The firſt are,

1. The languages; and among theſe,
   (*a*) His native language, in which he is to preach and exerciſe his miniſtry, and with which he ought to be perfectly acquainted.
   (*b*) The Latin language, which is the language of the learned world in general.
   (*c*) The Greek language, in order to underſtand the New Teſtament.
   (*d*) The Hebrew language, of which the Talmudian and Rabbinical idioms are a part.
   (*e*) The Arabic language.
   (*f*) The Syriac language.

(*g*) The

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(g) The French language. And
(h) The English language. The two latter of which now appear neceſſary to every man of letters, and particularly to a theologian, on account of the excellent works which are wrote in thoſe languages.

2. The principal parts of Philoſophy; as,
(a) Logic.
(b) Metaphyſics.
(c) Moral philoſophy.

3. Rhetoric and eloquence, or the art of ſpeaking correctly, of writing with elegance, and of perſuaſion.

To which may be added,

4. The elements of Chronology, and Univerſal Hiſtory.
5. The ſtudy of the Jewiſh antiquities.

He who would devote himſelf to the important employment of a theologian, and has the noble ambition to excel in it, ſhould early impreſs on his mind theſe truths: that the years which are paſſed at an univerſity are few; that they run rapidly away; that they are entirely engroſſed by the theoretic ſciences; and that he who does not carry with him to the univerſity a fund of knowledge in the preparatory parts of learning, commonly brings very little away, when his age or his parents oblige him to quit it.

VII. The theoretic ſciences of a theologian are,

1. The Dogmatic, or the theory of theology; which ſome Latin authors name alſo *thetica*, or *ſyſtematica*.
2. The Exegeſis, or the ſcience of attaining the true ſenſe of the holy ſcriptures.
3. The Hermeneutic, or the art of interpreting and explaining the ſcriptures to others. This differs in general but little from the exegeſis, and in ſome reſpects is quite the ſame.
4. Polemic theology, or controverſy.
5. Natural theology.
6. Moral theology.
7. Sacred criticiſm.
8. The hiſtory of the Church, under the Old and New Teſtaments.

VIII. The practical ſciences of a theologian are,

1. Paſtoral theology, which is divided into,
(a) Homiletic.
(b) Cathechetic.
(c) Caſuiſtic.
2. Conſiſtorial theology, which comprehends
(d) The Canon law.
3. The prudential exerciſe of the different functions of the miniſtry.

We do not here particularly name the *patriſtic theology*, (theologia patrum ſeu patriſtica,) becauſe all Chriſtian communions are not agreed in their opinions concerning the degree of authenticity and infallibility that is to be attributed to theſe ancients fathers of the church. The Proteſtants believe, that theſe primitive theologians were liable to error in their ſentiments as well as thoſe of our days; and, in all probability, that they were leſs ſkilful, leſs learned, leſs clear, and leſs accuſtomed to cloſe reaſoning, than the latter, as philoſophy was then more imperfect. But as we find in the writings of theſe fathers, many elucidations of the doctrine of the primitive apoſtles, and many irrefragable teſtimonies of the authenticity of divers remarkable events, which ſerve to eſtabliſh the truth of Chriſtianity; and as we there ſee, moreover, the origin of errors, of arbitrary ceremonies, and of many doctrines that have been introduced into the Chriſtian church; the reading and the ſtudy of theſe fathers cannot but be of great utility to the theologian. To a virtuous citizen, who unites ſuch various ſciences, and employs them in pointing out to his fellow-citizens the path that leads to temporal and eternal felicity in a word, to a wiſe theologian, what veneration is not due?

Of the Dogmatic.

I. Under the general term of dogmatic, we comprehend that part which the different writers on theology have called ſometimes theoretic, ſometimes ſyſtematic, and ſometimes thetic theology, &c. The term dogmatic appears to us the moſt general, and the moſt juſt, to expreſs the ſubject that we intend, as it comprehends *an entire ſyſtem of all the dogmas or tenets that each religion profeſſes;* whether it teach theſe dogmas by the way of theſis, as articles of faith; by public lecture; by catechiſing; or any other manner whatever.

II. Every poſitive religion muſt, naturally, have a ſyſtem of certain points of doctrine to propoſe to its followers; otherwiſe, each one would form a particular ſyſtem according to his own fancy; there would be as many different religions as there are individuals on the earth, and each ſociety would conſiſt of a confuſed maſs of fantaſtic opinions; as the different modes of thinking, and the different degrees of diſcernment, are varied and compounded by mankind to infinity; but truth, on the contrary, is uniform and invariable.

III. The Chriſtian religion is as compound in its dogmas, as it is ſimple in its moral principle. It includes, 1. The dogmas founded on the lights of reaſon: 2. Thoſe drawn from the Old Teſtament, and the law of Moſes: 3. Thoſe taken from the New Teſtament, and the doctrine of Jeſus Chriſt: 4. Thoſe that the fathers of the church have drawn from the Holy Scriptures: 5. Thoſe that the church, under the New Teſtament, has preſcribed to Chriſtians, by œcumenical and other councils aſſembled in different ages: 6. The dogmas that the popes, in quality of heads of the church, have eſtabliſhed by their bulls: and to theſe muſt be added, on the part of the proteſtants, 7. The dogmas that the reformers, eſpecially Luther and Calvin, have taught: 8. The deciſions of ſynods; and laſtly, the tenets that are maintained by the different ſects, as Socinians, Anabaptiſts, Quakers, &c. Each of theſe particular religions or ſects pretend to ſupport their dogmas both by reaſon and revelation: we do not here offer a work of controverſy, and are very far from attempting to determine on which ſide truth and reaſon are to be found.

IV Our zeal, however, for the Chriſtian religion in general, which we regard as perfectly divine, and as the only religion adapted to promote the happineſs of mankind in this world, and to ſecure it in the next, and the deſire we have that it may endure to the end of time, compels us to make in this place one important reflection; which is, That ſimplicity is ever an eſſential attribute of perfection, as complexity is of imperfection Now, it cannot be denied, without doing violence to truth, that among the different dogmas of which we have been ſpeaking, there are ſeveral that ſeem to be founded on ſpeculations very abſtruſe, on ſubtilties very intricate, and on interpretations very ambiguous. God certainly never intended that all mankind ſhould be theologians; he has not given them his divine word to be the cauſe of diſcord among men, nor that they ſhould paſs their whole lives

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lites in a painful ſearch after *objects of belief*, and *articles of faith*; and that they ſhould forego, in that purſuit, the neceſſary offices of life, and their duties as citizens. The dogmas, then, eſſentially neceſſary to the welfare of mankind, ought to conſiſt of a ſmall number, and to bear the marks of ſimplicity and perſpicuity; without which they muſt be imperfect, and conſequently the work of man. Our intention, in making this remark, is, to extend our voice, if it be poſſible, even to poſterity, whom we would conjure not to injure our religion, ſo holy and ſo admirable, by a multiplicity of dogmas. It is neceſſary, however, that the divine, who makes it his ſtudy and his profeſſion, ſhould be thoroughly acquainted with the theory of this ſcience, in order that he may be able to inſtruct the ſincere Chriſtian, and to explain the nature of each particular dogma, as well as the ſolidity of its proofs; and to this it is that the ſtudy of the dogmatic leads; of which we ſhall now continue the analyſis.

V. The dogmatic is then nothing but *a ſuccinct expoſition of all the dogmas of the Chriſtian religion, in a natural and philoſophical order*. By the word philoſophic, we do not here preciſely mean the method of mathematicians, in the manner the late M. Wolff has applied it to philoſophy; every ſubject is not capable of a demonſtration ſo exact and rigid; but a regular order is required in the arrangement of the general ſyſtem, and a connection is to be preſerved in the ſeveral matters that form it: the definitions ſhould be juſt; the diviſions exact; the arguments ſolid; the proofs clear; the citations concluſive; the examples ſtriking; and, in a word, every thing ſhould be adduced that appertains to ſo important a diſcipline.

It is very eſſential, moreover, in the dogmatic, at the beginning of each theſis, to explain the ſeveral terms that are peculiar to it, and that uſe has eſtabliſhed in treating of theology; to draw from each definition certain axioms, and from thence to form propoſitions, and to illuſtrate them by ſolid reaſoning. Laſtly, we ſhould not neglect, in ſuch a ſyſtem, to make uſe of the expreſſions uſed in the ſymbolic books that have been received by the whole Chriſtian church, and which cannot be rejected or altered, without cauſing a confuſion in our ideas, and in the general ſyſtem of the Chriſtian religion. But before we make the leaſt advance in the ſtudy of Chriſtian theology, it is indiſpenſably neceſſary to examine the proofs by which the truth, the authenticity, and the divinity of the ſacred and canonical books are eſtabliſhed; for this is the foundation of all the dogmas and the axis on which its whole doctrine turns.

VI. The ſyſtematic part of the Chriſtian religion, among the great number of its dogmas or theſes, has *three principal*, from which all the reſt are derived, and which form the baſis of its whole doctrine:

1. The exiſtence of one God in three perſons.
2. The neceſſity of a Mediator or Redeemer.
3. The real appearance of the Mediator or Meſſiah on the earth.

Whoever writes, profeſſes, or teaches the dogmatic, ſhould be, above all things, careful well to eſtabliſh theſe important truths; to evince them by the ſtrongeſt and moſt evident proofs, drawn partly from the lights of reaſon, and partly from revelation: and he will then ſee, with what facility all other theſes flow from, and how eaſy it will be to prove them by, theſe.

VII. The infinite variety that is found among mankind in their manner of thinking, and in their method of treating ſubjects; the frequent changes that have happened in the exterior form of philoſophy, and in the method of treating it; the oppoſitions that have been raiſed at all times againſt divers doctrines of the Chriſtian religion; all theſe have produced, among theologians, different ſyſtems of the dogmatic. Sometimes they have combined poſitive theology with morality, and have formed a ſyſtem that they call *theologia theoretico-practica*, or *theologia thetico-moralis*, &c.: ſometimes they have refuted the arguments that others oppoſe to certain theſes; and from thence has aroſe a ſyſtem that they call *theologia thetico*, or *dogmatico*, or *poſitivo-polemica*: ſometimes they have joined to natural theology that of revelation; and have formed a dogmatic, called *philoſophico-theologica*: and ſo of the reſt. But, beſides that theſe diſtinctions and denominations are in themſelves pedantic, it is at all times more eligible, in every ſcience, to avoid confounding with each other the ſeveral branches of which it conſiſts. The different dogmas, morality, philoſophy, and controverſy, are ſeparate articles; and when each of theſe parts of theology are ſeparately treated, they are diſpoſed with more order in the mind, and a greater light is diffuſed over their ſeveral ſubjects.

VIII. It appears, moreover, from the ſimple enumeration that we have made, in the third ſection, of the different principles on which the dogmas of the Chriſtian religion are founded, that, to be thoroughly acquainted with its whole theory, the theologian ſhould alſo apply himſelf to the ſtudy of the ſymbolic books of its communion, and eſpecially ſhould be well verſed in the *Creed of the Apoſtles*; that of *Nice* and *St Athanaſius*; the book called *Formula concordiæ*; the *Theſes of the council of Trent*; the *Catechiſms of Luther*; the *Confeſſion of Augſbourg*; the *Articles of Smalcalden*; the *Catechiſm of Heidelberg*, &c. That he ſhould be well acquainted with that part of Theology that is called *patriſtica*: that is to ſay, that he ſhould be well read in the fathers of the church; that he ſhould not be ignorant even of *ſcholaſtic theology*; that he ſhould at leaſt know the frivolous ſubtilities and the complicated method of the ancient ſcholaſtic divines, which was derived from the philoſophy of Ariſtotle and the ſchools; that he ſhould make a ſerious ſtudy of the *ſacred* hiſtory of all ages, the *councils and ſynods*; that he ſhould, above all, never loſe ſight of *natural theology*; and, laſtly, that it is indiſpenſably neceſſary that he ſhould procure a good bibliotheque or treatiſe of eccleſiaſtical writers *, which he may conſult occaſionally, and learn from thence to know the beſt guides. The more a theologian applies himſelf to all theſe ſubjects, the more ability he will acquire in this ſcience, and the more perfect he will be in the theory of that religion which it is his duty to teach to others.

IX. Revealed religion being founded (at leaſt in great part) on natural religion, and philoſophy being the ſource from whence the principles and the knowledge of the latter are derived, it is evident that philoſophy is intimately connected with theology: nevertheleſs, the aid of the former is to be employed with precaution, and is not to be regarded as the foundation of the theological dogmas, but only as a mean by which they may be explained and enforced. The Holy Scriptures conſtitute, perpetually, the true baſis of revealed theology: philoſophy effectually concurs, however,

* Thoſe of Du Pin and William Cave are moſt celebrated.

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to prove the exiſtence and the attributes of the Supreme Being; the neceſſity of the creation of the univerſe by Almighty God, in oppoſition to every other poſſible manner of its being produced: it furniſhes, moreover, plauſible conjectures concerning the intention of the Almighty in creating this world; it proves the neceſſity of a perpetual power to preſerve it; it ſuppoſes, that, as God could not produce any thing that was not perfect in its kind, he could not have created man as he now is; it vindicates the conduct of the Supreme Being, in appointing chaſtiſements for tranſgreſſions, by ſhewing that moral evil was not introduced into the world by abſolute neceſſity, but by the abuſe of liberty, the moſt noble prerogative of the human ſoul; it determines the neceſſity of a Mediator; it furniſhes arguments for the belief of the immortality of the ſoul, and of a future ſtate that has a relation to the moral actions of this life; and laſtly, it inſpires a love of God as a Being of ſovereign perfection, a gratitude towards him as our creator and preſerver, and a ſubmiſſion to his will as our ſupreme ruler and director, motives of all others the moſt powerfully conducive to a virtuous conduct.

X It is this uſe which theology makes of philoſophy, that has given occaſion to divide the theſes of the dogmatic into pure and mixed; that is, into theſes that are founded entirely upon revelation; and, ſuch as ariſe from an union of reaſon with revelation. Of the firſt ſort are, 1. The article of the Holy Scripture itſelf; which treats of its divine origin, its authority, and its efficacy. 2. The dogma of the Trinity. 3. That of the origin of evil, or of original ſin. 4. The whole article of Jeſus Chriſt. 5. The dogma of the efficacy and operations of the Holy Ghoſt. 6. That of the ſacraments 7. That of repentance. 8. That of the belief in Jeſus Chriſt. 9. That of good and bad angels. 10. That of the end of the world, and the laſt judgement. 11. That of the church, &c. The mixed dogmas or theſes are, 1. The doctrine of a Supreme Being, in general; his being, his attributes, and his works. 2. That of the creation. 3. That of providence, or the conſervation of the world. 4. Of ſin, as a tranſgreſſion of the laws of God. 5. Of rewards and puniſhments after death, *&c.* He that attentively ſtudies, thoroughly comprehends, and well digeſts all theſe theſes, will have reaſon to reſt content with his knowledge of the dogmatic.

Of the EXEGESIS *and the* HERMENEUTIC.

I. THE term *Exegeſis* is derived from the Greek verb EXE'GOMAI, which ſignifies to *relate* or *explain*; and that of *Hermeneutic* from ERME'NEUEIN, which means to *ſearch into*, and, in a figurative ſenſe, *thoroughly to examine*, and *interpret*. The learned, but eſpecially the theologians, make uſe of theſe words, ſometimes as ſynonyma, to expreſs the ſame thing, and ſometimes (as there are ſcarce any terms that are perfectly ſynonymous) to denote a ſmall difference between two parts of learning of the ſame nature. By the word Exegeſis they mean, *that ſcience which teaches clearly to inveſtigate the true ſenſe of the original text of the holy ſcriptures*; and by the Hermeneutic, *the art of interpreting and explaining the holy ſcriptures to others* *. This diſtinction is ſo ſubtle, that it becomes almoſt frivolous. They are, in fact, the ſame ſcience; the one is only an explication of the other, and for that reaſon we think we are authoriſed to treat of them together in this place.

II. In order to the true underſtanding of the ſacred text of all the books contained in the Holy Bible, whether of the Old or New Teſtament, it is abſolutely neceſſary that the theologian be thoroughly acquainted, not only with the languages in which theſe books were originally wrote, but likewiſe with the hiſtory and antiquities of thoſe remote times in which their authors lived. With regard to reſearches into the hiſtory of the Jewiſh nation, their antiquities, their morals, and their cuſtoms, it will be found advantageous to purſue it as far as the nature of the ſubject will admit, without, however, engaging in critical ſubtleties, that lead to a labyrinth to which there is no end, and have ſpread more clouds over theology than even the ſcholaſtic controverſies have formerly done.

III. He who would ſucceſsfully interpret any work whatever, ſhould firſt conſider the ſpirit in which it is wrote: he ſhould attentively reflect on the general deſign of that work, and the particular motives that induced the author to undertake it; his genius, his paſſions, his taſte; the time, the place, and the people for whom it was written. Theſe conſiderations are, above all, neceſſary, when we would undertake the explication of the Holy Scriptures. Independent of thoſe reflections which the theologian will of himſelf naturally make on the ſubject, the excellent commentaries which we have on the Bible, in which the greateſt men of every age have exerciſed their genius, may ſerve him as a guide in this courſe. The critical hiſtories will likewiſe afford great aid, and throw admirable lights on this matter. Clear ideas, an acute diſcernment, and a ſolid judgment, will complete the work.

IV. With regard to the languages neceſſary for underſtanding the ſacred text, the Hebrew language hold the firſt place. The ſtudent ſhould have early recourſe to the *manner of accenting*, and the *Maſſoret* of the Jews: to theſe he may add, with advantage, the reading of the Jewiſh interpreters or *Rabbins*. There are the grammars and dictionaries, Rabbinic and Talmudic, of Buxtorff, Cellarius, and others, which greatly facilitate his ſtudy. The Talmud, it is true, is ſtuffed with a thouſand fables and ridiculous ſtories; it contains, notwithſtanding, ſome things uſeful and curious, which the learned theologian ſhould not entirely paſs over. For the well underſtanding of the explications and applications of the beſt Rabbins, he ſhould likewiſe have recourſe to their *Cabbala*, which they divide into *real* and *liberal*.

V. The *Maſſoret* is a kind of critic on the Hebrew text, that the ancient Jewiſh doctors invented; in order to prevent any alteration, They there count the verſes, the words, and the letters of the text, and have marked all their diverſities. The text of the ſacred books was formerly wrote in cloſe continuation, without any diſtinction of chapters, verſes, or even words, after the manner of the ancients, as we ſtill ſee in many manuſcripts. As the ſacred books have undergone an infinity of changes, which form various readings; and as the true original has been either loſt or altered; the Jews have had recourſe to this rule, which they have judged infallible, and which they call the Maſſora, to fix the reading of the Hebrew text.

VI. The ancient Rabbins, or Doctors of the Jewiſh law, have

* The Exegeſis is a kind of rational grammar. The Hermeneutic is the art of interpreting entire paſſages.

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have wrote many ſuperſtitious traditions, which they obſerve as ſcrupulouſly as the law of Moſes; and have alſo made many commentaries on the ſacred text, among which there are ſome that are good and uſeful. The language they uſe is different from the common Hebrew, as is alſo the Rabbinic character.

VII. The *Talmud* is a book in which the Jews have compriſed every thing that concerns the explication of their law, and the duties that are enjoined them by ſcripture, by tradition, or by authority of their doctors; by their particular cuſtoms, their civil government, their doctrine, their ceremonies, their moral theology, the deciſions of caſes of conſcience, *&c.* The Talmud is compoſed, in general, of two parts; which are called, the *Miſchna*, and the *Gémara*. The Jews would not at firſt commit theſe things to writing; but after the deſtruction of Jeruſalem, finding themſelves diſperſed in the world, they became obliged to do it. They had two celebrated ſchools, one at Babylon, and the other at Jeruſalem; at theſe ſchools were made two different collections of traditions, each of which is called the Talmud. The commentary, called Gémara, contains the deciſions of the Jewiſh doctors, and their explications of the text; it is filled with abſurdities, reveries, and ignorance, and written in a vulgar ſtyle. On the contrary, the text, that is called Miſchna, conſiſts of ſolid reaſoning, written in a pure ſtyle. The Rabbin Moſes, ſon of Maïemon, has made an abridgement of it, which is of more value than even the Talmud itſelf.

VIII. The Cabbala or Kabala (a Hebrew word, which properly ſignifies tradition) contains the different interpretations of the laws of God by different Rabbins; their deciſions on the obligations that they impoſe, and the manner of performing them. There are ſome of them that are occult and myſterious, and conſiſt in ſingular and myſtic ſignifications which are given to a word, or even to each of the letters that compoſe it; and from theſe various combinations, they draw explications of the ſcripture very different from that which it ſeems naturally to import. This *Cabbala* is divided into three kinds: the firſt they call *Gématria*, and conſiſts in taking the letters for the numbers of arithmetick, and explaining each word by the arithmetick value of the numbers that compoſe it: the ſecond is called *Notaricon*, and conſiſts in taking each letter for a word, or in compoſing a word of the firſt letters of ſeveral words: the third is called *Thémura*, and conſiſts in changing a word, and the letters of which it is compoſed.

IX. The *Chaldee* ſeems to be indiſpenſible, after the ſtudy of the Hebrew and Rabbinic; this is properly no more than a particular dialect of the Hebrew language. The Jews give to their commentaries, and to the Chaldaic paraphraſe on the Scripture, the title of *Targum*. As, during their long captivity in Babylon, they had forgot the Hebrew, and only retained the Chaldean language, it became neceſſary to explain the prophets in that language; and to this neceſſity is owing the firſt commencement of the Chaldean paraphraſe. The Rabbins have ſince collected together theſe divers interpretations of their doctors, which form the paraphraſe that is called Targum.

X. The other oriental languages, as the Arabic, the Syriac, the Samaritan, and the Coptic, are alſo of great uſe to the learned theologian.

XI. All the books of the New Teſtament being wrote in Greek, the ſtudy of that language becomes neceſſary to the theologian. But it muſt not be imagined, that this Greek is that of Athens or Lacedemon; and that they who underſtand the New Teſtament, will fully comprehend Homer, Anacreon, or Thucidydes. It is very neceſſary to obſerve, here, that during the Babyloniſh captivity, the Jews, as we have juſt ſaid, having forgot the Hebrew, and having adopted, in proceſs of time, ſeveral idioms, the Greek language was at laſt ſucceſsfully diffuſed over almoſt all the eaſt; and, at the time of the coming of Jeſus Chriſt upon the earth, that language was in uſe in Paleſtine, not only among men of letters, but in the polite world: every thing was wrote, every thing was treated of, in Greek. The Jews no longer underſtoood the Holy Scriptures in the Hebrew language, but made uſe of the verſion that the Septuagint had made of the Old Teſtament in the Greek language. The evangeliſts and the apoſtles, therefore, wrote their hiſtoric relations, as well as their epiſtles or letters, in the ſame language: but their ſtyle is not pure, being ſtrewed with hebraiſms and barbariſms, and with theological terms and phraſes. The four evangeliſts differ, moreover, among themſelves, with regard to their ſtyle; and ſo do the apoſtles: St Matthew is not ſo elegant as St John; nor St Jude ſo elegant as St Paul, who was a man of letters, and an able writer. The diction of St Luke is the moſt elegant, and moſt correct, eſpecially in his book of the acts of the apoſtles.

XII. The tranſlations that have been made of the ſacred books in the weſt, will alſo very frequently aſſiſt in clearing up many paſſages.

XIII. The Jewiſh antiquities are naturally connected with the ſtudy of the ſacred hiſtory of the Old Teſtament. *Joſephus* is the beſt author who has wrote on this ſubject. *John Marſham*, *Voſſius*, *Lælius*, *Gyraldus*, &c. are the moderns to whom we are indebted for learned reſearches in theſe maters. *Hermannus Wilſius*, in his treatiſe *de Ægyptiacis*, has thrown admirable lights on the Egyptian antiquities. The antiquities of the Chaldeans, Babylonians, Perſians and Medes, has been excellently well explained by *Barnabas Briſſon*, in his book *de regno & rege Perſarum*; and by *Thomas Hyde*, in his treatiſe *de religione et ſacris Perſarum* The writings of *Meurſius*, and the *Compendium Antiquitatum Græcarum* of *John Potter*, are very uſeful to give theologians an idea of what they will find neceſſary to know of the Grecian antiquities; and laſtly, the abridgement of *Cantel* will make them ſufficiently acquainted with the Latin antiquities.

XIV. *Spencer* has given an excellent work on the ceremonies of the Jewiſh religion, *de Legibus Hebræorum ritualibus*, &c. We have likewiſe works that fully treat of their temples, their ſacrifices, their prieſts and Levites, their paſſover and purim, of their tithes, their veſtments and ſacred habits, and of their manners and cuſtoms; but it would be too prolix to mention all theſe in this place.

XV. The modern commentaries on the Holy Scriptures may alſo ſerve to inſtruct the young theologian; but he ſhould uſe them with caution and moderation. All that glitters is not gold, as well in this inſtance as in others; and a man of learning ſhould not often make uſe of other peoples eyes.

XVI. The Bibles called *Polyglots* are alſo of great aſſiſtance in interpreting the ſacred text. They are printed in ſeveral languages. The firſt is that of cardinal *Ximenes*, printed in the year 1515, and called the *Bible of Complute*; it contains the Hebrew text, the Chaldean paraphraſe,

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phraſe, the Greek verſion of the Septuagint, and the ancient Latin edition. The ſecond is that which is called the *Royal Bible*, printed at Antwerp in 1572. The third, that of *le Jay*, printed at Paris in 1645. The fourth is the *Engliſh polyglot*, printed at London it 1657, of which Walton is the editor. There are ſtill ſeveral more that have been printed ſince, but they are neither ſo complete nor ſo celebrated as the former.

XVII. The Bibles that are called *Biblia Gloſſata*, are alſo here of very great uſe. The ſacred text is there every where accompanied with explanations and obſervations. There are of theſe in each of the three principal communions of the Chriſtian Religion, and in moſt of the modern languages of Europe. Laſtly, as the interpretation of the ſacred text depends in a great meaſure on the lights and the proofs drawn by comparing together different paſſages of ſcripture, there are ſeveral Bibles where the editors have placed, on the ſide of each verſe of the text, what they call the *Concordance*, that is, a citation of other parallel paſſages, which are found diſperſed in the Old and New Teſtament. Theſe Concordances are of daily and indiſpenſable uſe to the divine, in compoſing his ſermons, and in many parts of his miniſtry. See Bible.

XVIII. Theſe parallelifms are yet different from that which theologians call the *real parallelifm*; by which they mean, *the relation that the typical or parabolic ſenſe of a paſſage has with what the expreſſions literally imply, or ſeem to imply; the myſtic ſenſe with the real ſenſe; the figures and the images that the ſacred authors have employed, with the things or the objects that they intended to deſcribe.* The greateſt theologians have taken infinite pains in determining theſe points, explaining them, and producing their proofs: in many places they have ſucceeded; and we cannot but admire their ſagacity, their zeal, and their ſucceſs: it muſt be acknowledged, however, that they have not yet cleared up all the obſcurities; that there are many dark paſſages ſtill remaining in the prophets, in the Song of Songs, in the book of Job, and above all in the Apocalypſe; on which have been hitherto throwo mere glimmerings, which are very far from affording a ſufficient light. The explications that have been attempted of theſe paſſages are frequently ſo unjuſt, ſo unnatural, and improbable, and at the ſame time ſo futile, that they rebel againſt common ſenſe, and only give us occaſion to deplore the imbecility of the human underſtanding.

XIX. The laſt labour of him who would become acquainted with the Hermeneutic, is in what is called *Lectio Acroamatica*; by means of which, each book of the Holy Scripture is examined from one end to the other, with relation to geography ancient and modern, genealogy, chronology, hiſtory, and antiquities; from whence a rational ſyſtem is formed, according to the rules of ſound logic. This work is attended with ſo many difficulties and diſtractions, that it is almoſt impoſſible to accompliſh it, without the aſſiſtance of a guide, an able profeſſor, and a complete academical courſe.

XX. Furniſhed with theſe ideas, the theologian may venture to inveſtigate the true ſenſe of thoſe paſſages of Holy Scripture that may appear to him obſcure, contradictory, or difficult, and to interpret them to others: but he will be more wiſe, and leſs vain, than to attempt to impoſe his deciſions on mankind, at all times, as authentic and infallible. The human diſcernment is ever confined and imperfect; and God has not granted to any man, to any theologian, or aſſembly of divines, an excluſive power of interpreting his divine word: he has moreover denounced his anathema againſt all thoſe who ſhall add, or take away, a ſingle word thereof. But to explore the true ſenſe of any paſſage, and to explain it to others, cannot certainly be deemed either adding or retrenching.

Of Sacred Criticism.

I. As the authors and profeſſors, who treat of the different parts of theology, make frequent mention of the ſacred criticiſm, we muſt not omit to ſhew in what manner it is connected with the Exegeſis and the Hermeneutic, and in what reſpect it forms a ſeparate doctrine or ſcience. Criticiſm, in general, is in fact no more than a ſuperior part of grammar; a kind of rational grammar founded on reflection, and the rules of language; but which employs the aid of divers other ſciences, as hiſtory, chronology, antiquities, *&c.* in order to ſearch out and determine the true ſenſe of an obſcure or ambiguous paſſage. The ſacred criticiſm is only diſtinguiſhed by its object; it adopts the ſame rules, but it adds others which take their riſe and principles from the peculiar language of the New Teſtament; and has regard to the Bible in general, an account of the nature, eſſence, and qualities of its divine Author. So far it has an intimate connection with the Exegeſis

II. But, if we would conſider it as a ſeparate ſtudy, we may ſay, that it is a ſcience which is employed in examining the exterior circumſtances of the Holy Scripture. For example: in what time each book was wrote; who was its author; the preciſion and fidelity of the text; the diſtinction between the canonical books and the apocryphal; and many other matters of like nature. In order ſtill the better to ſhow in what manner, and with how much precaution, the ſacred critiſm proceeds in its operations, we ſhall here recite ſome of thoſe ſubjects that belong to its province.

III. It is commonly received, that it was Eſdras who, after the return from the captivity of Babylon, collected and fixed the canon of the ſacred books of the Old Teſtament. This at leaſt is the opinion of the Jews, who all attribute to him that glorious work; and the aſſertion appears ſo much the more probable, as it was the ſame Eſdras who reſtabliſhed their ſtate, who brought the whole Jewiſh people into one body as a nation, and formed the Judaic republic, which was ſo intimately connected with their religion. The collecting of the canon of the books of the New Teſtament is attributed, with great appearance of probability, to St John; although hiſtoric and formal teſtimonies of it cannot be produced, unleſs it be what Euſebius relates of the four Evangeliſts. In proceſs of time, each council has decided what books ſhould thereafter be held by the Chriſtian church as canonical; and we commonly find, at the end of the decrees of each council, a repertory or liſt of thoſe books.

IV. The Old Teſtament was wrote in Hebrew, except a ſmall number of paſſages where the dialect is Chaldean. The form of the letters or characters, as we now have them, are alſo properly Chaldean; whereas, before the Babyloniſh captivity, the Samaritan character was probably uſed. Buxtorff and Capell have had warm diſputes upon the ſubject of the vowel-points: the former would retain theſe points, and the latter rejects them; each of them has had his adherents. As it is impoſſible to decide in this diſpute but by hiſtoric proofs;

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proofs; and as theſe are not to be had, either for one ſide or the other; it is beſt to leave the affair undecided: not totally rejecting the points, however; as they are of infinite uſe in the ſtudy of the Hebrew language. They who love to introduce novelties into religion, (ſay the partiſans of Buxtorff,) would doubtleſs be charmed to ſee the points totally aboliſhed, becauſe they then could make whatever they pleaſed of the ſacred text. The adherents of Capell maintain, on the contrary, that by the ignorance or inadvertence of copyiſts, theſe points may have been tranſpoſed formerly, or may be eaſily confounded and wrong placed hereafter; which may occaſion the moſt dangerous errors; may give riſe to contrary meanings, and whimſical explications of the ſcripture; whereas, by not admitting the points, an able theologian will preſerve, at leaſt, the liberty of explaining a paſſage according to analogy, and the rules of good ſenſe.

V. The *accents* have given riſe to full as many diſputes. But this queſtion is not decidable but by the ſame method as the preceding: for we clearly ſee, by all the ancient manuſcripts, that even the Greeks and Romans have wrote without accents, but that both one and the other make uſe of vowels. In poetical works eſpecially, it is almoſt impoſſible to omit them; and that language being now dead, without accents we can find no cadence, no meaſure. Father Montfaucon aſſerts, with great appearance of probability, that accentuation was not introduced till the ſeventh century

VI. The language of the New Teſtament is the Greek; for all that is ſaid of the goſpel of St Matthew being wrote in Hebrew, and of that of St Mark being originally compoſed in Latin, is but weakly ſupported. The ſtyle, as we have already remarked, is not pure, whatever ſome zealots may improperly, and without reaſon, aſſert to the contrary. The language of the New Teſtament abounds with hebraiſms.

VII. The preciſion, the truth, and correction of the text, is the reſult of repeated and judicious compariſons of the variations; of which there are, according to Dr Mill, more than twenty thouſand Theſe variations have proceeded, partly from the negligence of the copyiſts, and partly from the ignorance of the reviſors and correctors of the ancient manuſcripts, who have frequently added and incloſed the comments, which were wrote in the margin, with the text. The heretics of the firſt ages, and the impoſtors, have alſo made divers alterations in the text itſelf, in order to ſupport their errors; and theſe alterations have ſlid into other copies. It is the common rule to follow the moſt ancient manuſcripts; as it is ſuppoſed, with reaſon, that they are the moſt correct: and to theſe are alſo added the moſt ancient verſions.

VIII. The firſt of theſe verſions is that of the *Septuagint*, which has been at all times highly eſteemed, as well by the Jews as the Chriſtians. The Hebrew language being loſt by the Jews during the captivity in Babylon, and the Greek dialect becoming the common language of the eaſt, that verſion was made in Egypt by public authority, and for the uſe of the common people. The ſecond is that called the *Vulgate*, which was formed from the tranſlation of St Jerome, and from another that was called *Verſio antiqua*. After theſe two tranſlations come the Greek verſions, among which are reckoned, 1. That of *Aquila*, who has tranſlated the original Hebrew verbatim, by putting over each word of the Hebrew text, its correſponding Greek term. 2. That of *Symmachus*, who applied himſelf to write the Greek with purity and elegance. 3. That of *Theodotion*, who has very cloſely followed the text, notwithſtanding the fine language he employs. *Origen* publiſhed theſe verſions in ſix languages in his edition of the Old Teſtament, which he calls *Hexapla*. To all theſe verſions may be added, 4. Thoſe of *Jericho* and *Nicopolis*, which are much celebrated. We have not now any one of theſe verſions entire. The fragments that remain of them have been collected and publiſhed by *Druſius* and F. *Montfaucon*. Laſtly, The *Syriac verſions*, of which one was made on the Hebrew text, and the other on the Greek.

IX. The ſacred criticiſm is likewiſe employed in acquiring a knowledge of the principal and moſt celebrated manuſcripts, as well of the ſacred text itſelf, as of the tranſlations; in learning to diſcern the hand-writing, and the eſſential characteriſtics which diſtinguiſh the real original from the counterfeits: and laſtly, it is employed in knowing the beſt modern editions of the Holy Bible; as for example, the Polyglots, among which thoſe of London, of the years 1653 and 1655, are the beſt. The introduction by Walton, which is at the beginning of theſe editions, is a model and a maſterpiece of ſacred criticiſm.

Of Moral Theology.

I. If it were allowable to compare the Saviour of the world to a weak mortal, we would ſay, that the conduct of Jeſus Chriſt reſembled that of Socrates, who has left us no part of his doctrine in writing, but whoſe whole inſtructions (as well as the particulars of his life) have been collected, digeſted, and publiſhed, by his diſciples. The Evangeliſts are the only hiſtorians of the Meſſiah: it is to their labours that we owe the knowledge of his actions upon earth, and his divine doctrine. The four Evangeliſts, and the Acts of the Apoſtles wrote by St. Luke, contain therefore *alone* the hiſtory of the life of Jeſus Chriſt, and the doctrine that he taught. His apoſtles and diſciples began by paraphraſing his doctrine, as well by their evangelic ſermons, as in the epiſtles they addreſſed to the faithful of ſeveral Chriſtian Churches: they have given explications, and have added paſtoral inſtructions, which are in effect admirable; but which, nevertheleſs, form not the original text of the diſcourſes of our Saviour. The biſhops of the apoſtolic century, the fathers of the church in all ſucceeding centuries, the other biſhops and eccleſiaſtics, the councils, the ſynods, the doctors of theology, the popes, the conſiſtories, the reformers likewiſe, and an infinity of theologians, have drawn from the Goſpel, and ſometimes alſo from the letters of the apoſtles, and from other commentaries on the Goſpel, various tenets; which, united, form at this day the general ſyſtem of the Chriſtian Religion. The theologians who devote themſelves to the ſervice of the altar, ſtudy this ſyſtem in the dogmatic: the laity learn it by means of catechiſms; and after they have made confeſſion of their faith, ſolemnly adopt it, when they are received into the boſom of the church.

II. It is not the ſame with regard to the morality of Jeſus Chriſt, which every one may read in the Goſpel; and to know which, it is not neceſſary to become learned, nor to ſtudy a complicated ſyſtem. If the dogmatic were not armed with a thouſand arguments to eſtabliſh the Divinity of Jeſus Chriſt, yet would the morality of his Goſpel ſufficiently prove it; ſeeing that it is perfectly holy, entirely

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ſimple, ſtrictly juſt, and moſt completely adapted to promote the felicity of the human race in this world, and in that which is to come. The Saviour of the world has not enjoined any part of mankind to engage in diſputes, or abſtract refinements: the ſole command that he has given them is, *to believe in his Goſpel*; and that is compriſed in one word only, Love: the grand and only principle on which the whole of his ſacred doctrine is founded.

III. To produce the greateſt effects poſſible, by the leaſt efforts, is the higheſt perfection in nature, and at the ſame time the true characteriſtic of Divinity. God has given to all the beings that compoſe the univerſe, one ſimple principle alone, by which the whole, and every part, is connected and perpetually ſupported; and that is Love. The attraction of the celeſtial bodies, as well as of thoſe of which our globe is formed, is a ſpecies of *love*; a mutual tendency toward each other. The uniform generation, by which all beings are perpetuated, is founded in *love*. This is the true *minimum*, the true ſyſtem of *the leaſt action*, which includes ſomething ſo divine. It appears to be the will of God to eſtabliſh, by the mouth of the Meſſiah, the ſame ſimple principle in morality, that is, in the rule of human actions, by ſaying, *Love*: in a word, it was his will, that in the conduct of mankind, as in every other part of nature, there ſhould be no other principle than that of Love.

IV. That in the different ſyſtems of ethics of the ancient Heathen Philoſophers many maxims and precepts of admirable morality are to be found, cannot be denied; but, beſide that theſe philoſophers are almoſt continually contradicting each other in their maxims, no one of their ſyſtems is founded on the true principle. In ſearching after it, they have diſcovered ſome excellent truths; but it has been by chance, and they are at beſt imperfect. Jeſus Chriſt has alone taught mankind perfect morals, by deducing them from this true principle. Every principle ſhould be ſimple: the ide of a compound principle implies at once an imperfection. Every principle ſhould be comprehenſive, even univerſal in its effects. Every principle, whoſe effects are limited, is imperfect. God himſelf is uniform in his principle, and infinite in his effects. His doctrine, or his law, ſhould be the ſame. Jeſus Chriſt has made known to mankind this principle, ſimple and univerſal. He has therefore been, in this ſenſe alſo, the true Saviour of the world. He has preached to mankind; and his only doctrine has been that of love.

V. By the word Love, with regard to *Bodies* in general, is meant a tendency, a mutual inclination that urges them to join and to coalleſce; and with regard to men in particular, a lively, affecting pleaſure, that poſſeſſes the mind on contemplating the perfections of any object. This pleaſure is always accompanied with a deſire, either to poſſeſs that object, or to render it propitious. By adopting therefore this principle, and this laſt definition of *Love*, it follows, that all the duties of man conſiſt,

1. In the love of God in preference to all other objects.
2. In the love of himſelf.
3. In the love of his own ſpecies.
4. In the love of every other creature to a certain degree.

The doctrines of Jeſus Chriſt are, in theſe reſpects, the moſt explicit.

VI. From this principle flows our *duty* towards God, towards ourſelves, our neighbour, and to thoſe beings that are ſubject to our power. The firſt rule is, to communicate to all thoſe, whom it is our duty to love, all the good, and to preſerve them from all the evil in our power. The ſecond, to do to no one what we would not have done to ourſelves in ſimilar circumſtances. The third, which is the ſimple effect of love, is to endeavour to pleaſe the object that we ought to love. The fourth, to endeavour to render the pleaſures that we communicate to others, as lively as poſſible, and thoſe inevitable evils, which we are ſometimes conſtrained to do to them, as ſupportable as we can; and ſo of the reſt. The whole evangelic doctrine of our Saviour is replete, from beginning to end, with admirable precepts for theſe purpoſes; and theſe precepts, with their applications, general and particular, we learn from that ſcience which we call Moral Theology.

VII. This doctrine we diſtinguiſh from moral philoſophy, or the ſimple doctrine of Ethics; becauſe Jeſus Chriſt has made known, in his divine morality, a far greater degree of perfection than is diſcoverable by the mere light of human reaſon. For the renouncing of ſelf-intereſt, and private pleaſure; the forgiveneſs of offences; the love of his enemies; the triumph over deſtructive paſſions; and many other like virtues, the Chriſtian is alone indebted to the doctrine of Jeſus Chriſt.

VIII. In order to ſhew, moreover, in a few words, of how eaſy, juſt, and natural an application all theſe precepts are ſuſceptible, we ſhall here give a few inſtances. "It is our duty to love God." Now nothing is more natural than to feel a lively and penetrating pleaſure in the contemplation of the united perfections of the Supreme Being; nothing more natural than a deſire to pleaſe him, and to render him propitious to us: and as it is not poſſible for us, weak creatures, to do him either good or evil, all our power to pleaſe him conſiſts in offering him an upright heart; a rational devotion; to be poſſeſſed with gratitude toward him, and to exert all poſſible efforts to accompliſh the end of our creation. "It is our duty to love all mankind;" and yet we inflict pains and chaſtiſments on ſome of them; we even put them to death: but we chaſtiſe them only to render them better, to prevent them from becoming pernicious to ſociety in general: we retrench the number of the living, as we cut off a corrupted branch of a tree, in whoſe preſervation we are intereſted: it is becauſe we love mankind, that we endeavour to prevent the deſtruction of the good by the malignity of the wicked: but it muſt ever be an indiſpenſible neceſſity alone that can compel us to chaſtiſement. "It is our duty, likewiſe, to feel a kind of love for other creatures, even for mere animals." Nevertheleſs we harraſs, we oppoſe, we deſtroy them. If we harraſs them wantonly, to ſupport a criminal luxury, or to ſatisfy a brutal pleaſure; if we purſue à ſavage chace, or encourage combats between animals themſelves, or other like horrible diverſions, we act contrary both to the ſpirit and the letter of the Goſpel. But if we deſtroy a part of theſe animals, to ſerve as an indiſpenſible nouriſhment to man, obſerving at the ſame time to put them to the leaſt miſery poſſible, and taking all neceſſary care for the preſervation of the ſpecies, we act in conformity to the laws of nature and of morality; we employ to our own preſervation, and to that of the reſt of mankind, what appears deſtined to that purpoſe by the Creator.

IX. Moral theology likewiſe differs from philoſophy, inaſmuch as it requires that our virtues be abſolutely diſintereſted: it enjoins us to fly the evil, and to purſue the good, merely as our duty towards God: it admits indeed the precept of the love of ourſelves, and the love of our neighbour; but

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but it regards this love only as a duty that reſults from our love towards God; and that from the principle, That God muſt love all his creatures as the work of his hands; and that we cannot therefore, from the very nature of love, pleaſe him, without entertaining ſentiments of affection towards thoſe to whom the Sovereign Lord of the Univerſe vouchſafes his benign regard. Now, as the Chriſtian morality does not regard virtue, but as it is a duty towards God; and as it conſiders all our actions, that have any other motive, either as blameable, or at leaſt imperfect, and as but little acceptable to the Supreme Being; it does not regard the advantages that reſult from them to ſociety, but as uſeful conſequences of the true Chriſtian virtue; and from this principle it draws new arguments for the encouraging of mankind to the practice of it.

X. From what has been ſaid, a ſecond difference ariſes between Chriſtianity and philoſophy. The firſt adds to the ſecond ſtill new motives to the practice of virtue. That of redemption, and pardon, obtained by Jeſus Chriſt, is not one of the leaſt. Its argument is this: If God has ſo loved mankind, as to afford them the means by which the evil, cauſed by their own fault, may be aboliſhed, it would be the greateſt of all ingratitude and malice towards himſelf, if man ſhould not endeavour to acknowledge this love, to merit it, and to embrace the means of pleaſing God. A third motive, taken alſo from the merit of Jeſus Chriſt, here offers itſelf as an auxiliary to the two former: According to the Chriſtian doctrine, man has not by nature the power to practiſe all thoſe virtues which are agreeable to God: but the ſame doctrine teaches, on the other hand, the conditions by which it is poſſible to pleaſe that moſt holy and perfect Being; and gives the Chriſtian hope alſo, that he ſhall never labour in vain.

XI. Laſtly, the Chriſtian morality is of far greater efficacy in adverſity, than philoſophy: it carries with it a wonderful conſolation in misfortune, and even in the hour of death; for the Chriſtian may ſay, with the Apoſtle, *that godlineſs* (or the practice of evangelic morals) *is in all things profitable, having the promiſe of the preſent life, and that which is to come.*

Of Polemic Theology, *or* Controversy.

I. We cannot ſufficiently lament, that the church of the God of peace ſhould be a *church militant*; and that a doctrine ſo ſimple and clear as that of the Goſpel ſhould be the cauſe of diſcord, even among Chriſtians themſelves. Nevertheleſs, as the truth is ſo difficult to diſcover in all things, and eſpecially in matters of religion; as it is ſo frequently covered with the clouds of intereſt and ambition; as the ſame object appears ſo different to different men; and as error, in the face of the world, conſtantly aſſumes the maſk of truth; it is but juſt that the true religion be furniſhed with arms to combat error, and to pluck off that deceitful maſk by which ſo many poor mortals are ſeduced.

II. The theologian, who has made the proper preparatory ſtudies, who is thoroughly inſtructed in natural religion, in the dogmatic and the hermeneutic, and who joins to theſe ſound logic, is already well prepared for this ſpiritual combat: he is armed, but he is ſtill to learn how to uſe theſe arms: he muſt alſo be made acquainted with the enemies he is to encounter, to know their force, and the arts they will uſe againſt him. It is plain enough, we ſuppoſe, that we here ſpeak of ſpiritual arms; of thoſe with which we are furniſhed by reaſon and the Holy Scripture: evil be to him that employs any other: force is ever an infallible proof of the want of argument. The propagation of a religion by the ſword, after the manner of Mahomet; perſecutions, either ſecret or open; conſtraint, violence, every ſort of religious war, is ſo atrocious, ſo contrary to the ſpirit of the Goſpel, in a word, ſo deteſtable, that every true Chriſtian muſt avert his ſight from ſuch infamous horrors.

III. Controverſy is conducted, either from the pulpit or chair, by way of harrangue, by converſation, or by writing. The firſt quality that is neceſſary to a diſputant is *reaſon*, and the next *moderation*; in what manner ſoever the conteſt is conducted, theſe two qualities ſhould conſtantly be manifeſt, during the whole courſe of altercation.

IV. There are ſome errors that attack the *ſyſtem* of religion, and there are others that attack even its *morality*. In order properly to oppoſe an error, we muſt begin by finding out its real meaning: we muſt therefore ſtudy the different ſyſtems of other religions, and the principal hereſies, if we would ſucceſsfully refute them. We don't mean by this, that the theologian ſhould know all the errors that ſpring up in the brain of each individual; we ſpeak only of thoſe that are profeſſed by whole ſects.

V. They who attack our religion, found their opinions, either on the interpretation of the ſacred text, or on philoſophy, or hiſtory; and we ſhould always oppoſe them with the ſame arms with which they pretend to defeat us. It is neceſſary to begin by diveſting ourſelves of all prejudice, in order the better to ſhew others thoſe prejudices by which they are deluded. We ſhould never make uſe, but eſpecially when we oppoſe weak minds, of opprobrious terms in the courſe of the debate, nor contend about words or expreſſions, nor attack incidental circumſtances that may attend erroneous principles; but bend our whole force againſt the root of the tree, the principal error; to uncover it, to dig it up, to deſtroy it.

VI. Polemic theology is taught in univerſities by two methods, according to the views of the ſtudent. If he learn it merely in order hereafter to defend his pariſhioners againſt the moſt prevalent errors, he is only to examine the principal controverſies according to the ſyſtematic order of theology; and may content himſelf with knowing their true meaning, together with the arguments of thoſe that oppoſe them. But if it be his intention to teach this ſcience to others, or to engage in controverſy, either by converſation or writing; in ſhort, if he aſpire to renown in it, he ſhould ſtudy the origin and hiſtory of each controverſy, he ſhould make himſelf a complete maſter of the arguments for and againſt it, the exceptions that it makes, its intereſts, its different revolutions and actual ſtate, *&c.* Theſe follow, in this ſtudy, either the order eſtabliſhed in the dogmatic, or that which is uſed in ſymbolic books, that is, ſuch as treat on articles of faith.

VII. In order the better to elucidate the method to be obſerved in this ſort of ſtudy, we ſhall ſay, that to acquire a complete knowledge of theological diſputes, the ſtudent ſhould, 1. Make the examen of each religion, and even of each controverſy. 2. He ſhould thoroughly examine his ſyſtem in the ſymbolic books, and likewiſe the ſources of his religion. 3. He ſhould preciſely determine the principal and capital error of each religion, ſect, or individual; that which is the ſource from whence all the other errors flow. 4. Search into the political cauſes of each error, and

each

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each controverſy, from hiſtory. 5. Examine the natural order according to which all the errors have taken their riſe, the one from the other: and laſtly, 6. Confront the reſpective arguments, the anſwers, and exceptions, that each party has made to defend its cauſe. To all this is to be added, 7. What they call *Collegium diſputatorium*; an exerciſe, by which all that is learned in the cloſet and in the ſchools is called forth and animated, under the inſpection of a profeſſor; and the mind is accuſtomed to think, and the tongue to ſpeak, with facility and efficacy.

VIII. The principal conteſts in which the theologian may be engaged, are, 1. Againſt thoſe who admit of no revealed religion; as the atheiſt and deiſt. 2. Againſt thoſe who admit of a revealed religion, but adopt not the true Revelation; as the Heathens, the Mahometans, *&c.* 3. Againſt thoſe who believe only a part of the true Revelation; as the Jews. 4. Againſt thoſe who add to the true Revelation matter foreign to it; as traditions, *&c.* 5. Againſt thoſe who make a falſe interpretation of the ſacred text, and draw from it erroneous ſyſtems; as the heretics and the ſchiſmatics, *&c.* And laſtly, 6. Againſt thoſe who make a wrong uſe of certain expreſſions of Revelation, and build, on whimſical notions, ridiculous ſyſtems; as the Fanatics, Quakers, *&c.*

IX. According to this diviſion, the theologian will have to combat principally with,

1. The Atheiſts, with Spinoſa at their head.
2. The Deiſts.
3. The Heathens and Idolaters.
4. The Mahometans.
5. The modern Jews.
6. The Arians and Manicheans, or rather thoſe who in theſe days follow their ancient errors.
7. The Socinians.
8. The Catholics, oppoſed to the Proteſtants.
9. The Proteſtants, oppoſed to the Catholics.
10. The Moliniſts, oppoſed to the Janſeniſts.
11. The Janſeniſts, oppoſed to the Moliniſts.
12. The Reformed, oppoſed to the Lutherans.
13. The Lutherans, oppoſed to the Reformed.
14. The Arminians.
15. The Anabaptiſts.
16. The Weigelians.
17. The Quakers or Tremblers.
18. The Fanatics, at the head of whom is Jacob Bohm.
19. The pretended new Prophets.
20. The Indifferents.
21. The Pietiſts.
22. The Moravian Brethren, or the Herenhuters, *&c.*

X. Now, as each of the religions, communions, or hereſies above mentioned, have not ſcrupled to publiſh to the world their dogmas and creeds, the theologian ought carefully to inſtruct himſelf in thoſe ſymbolic books, in which each of them have compriſed its ſyſtem; to ſtudy and to make a good analyſis of them; and to prepare ſuch arguments as are the moſt juſt, the moſt weighty, and proper to confute them.

XI. Before we quit this ſubject, there is one remark to be made, or rather one caution that is very eſſential, which we would offer to the young theologian; which is, that the polemic is uſeful, and even neceſſary in the ſtudy of theology in general; but that it is a diſcipline which ought to be treated with great prudence and moderation. Diſputation in general is a dangerous art; and religious diſputation is a deceitful art, and of infinite peril. The ſtudent will do right well to remember, that there is no ſect, no communion on earth, that is perfectly true in all its dogmas without exception; that there are ſome ſmall errors in all religions; that infallibility never was, nor ever will be, the portion of humanity. He ſhould likewiſe remember, that the maſters who teach him, or the books that he reads, are conſtantly partial to the religion they profeſs: and that when he has ſupported a theſis, and confuted his adverſaries in a collegial diſpute (where his adverſaries, as well as his preceptors, are of the ſame ſide of the queſtion, and will not fail to adjudge him the victory,) he ſhould be perſuaded, that the victory would not have been ſo eaſily obtained had he contended with able adverſaries of the oppoſite religion: he ſhould remember, that we triumph without glory when we combat without danger; and let him not be vain of his laurels, nor imagine himſelf ſome wonderful ſcholar; ſeeing that it is very poſſible, that he may go off victorious from ſuch a diſpute, that he may receive vaſt applauſe from his profeſſors and his colleagues, and at the ſame time have reaſoned like a dolt.

XII On the other hand, the moſt able theologians, and the moſt conſummate profeſſors in this ſcience, ought to be conſtantly on their guard againſt the abuſe of polemic theology; which frequently ſerves leſs to clear and confirm the truth of the dogmas of a communion, than to eſtabliſh perpetual diſcord and hatred among Chriſtians. Every theologian ſhould alſo remember, that by the nature of the ſubject, it is not poſſible to produce *demonſtration* in ſupport of his theſes and opinions; but that his arguments will be only valid, and preponderate in proportion to their degree of evidence; and laſtly, that it is a ridiculous and inſufferable vanity to imagine, that every man, who does not think preciſely as we do, is guilty of palpable error.

Pastoral Theology.

I. Having deſcribed the theoretic ſciences of theology, we now come to thoſe which regard the practice. It would be to bury the talents that God has given him, and the ſtudies that he has made, if the theologian did not employ them to the edification of his neighbour, and the proſperity of the Church. His office in ſociety is attended with conſtant and anxious labours. He is charged with the *cure of ſouls*, with the inſtruction of youth with preaching of the Goſpel, the conduct of his flock, and the adminiſtration of the Sacraments, with viſitations to the ſick and the dying, with calming the terrors of weak minds, with adminiſtring comforts to afflicted ſouls, and many other functions equally difficult and important. The practical ſciences that we ſhall here deſcribe, will ſerve him as guides in this unbounded field.

II Paſtoral theology is uſually divided into three parts; which are,

1. Homilitic Theology.
2. Catechetic Theology.
3. Caſuiſtic Theology.

To which are added,

4. The Conſiſtorial Prudence.
5. The prudential Exerciſe of the different functions of the miniſtry.

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As the homily makes a part of eloquence, it is unneceſſary to ſay any thing of it in this place, but treat the others in their order.

III. It is in vain that a ſon of the church poſſeſſes all the ſciences that belong to his profeſſion, that he is an agreeable and even a renowned preacher, if he do not give a life, an efficacious ſpirit, to his miniſtry, by a *good example*; for that is the firſt precept in paſtoral theology. He is at the head of a flock, and ought to be their guide: but how abſurd, if his words and his actions be at continual variance with each other! How ſcandalous, if he be not the firſt to practiſe theſe leſſons of wiſdom that he preaches! How indecent, if, while he edifies by his diſcourſes, he diſguſts by his morals! What baſeneſs, if he ſhould even glory in his irregularities! It is leſs ſhameful for a ſoldier to relate that he has tamely ſuffered an affront, than for an eccleſiaſtic to boaſt of his debaucheries! Both the one and the other is a diſgrace to his profeſſion.

IV But this exemplary conduct ſhould be free from all affectation in the external behaviour. A ſingularity of dreſs, and an air of auſterity; the head declined, the eyes turned up to heaven, the hands conſtantly claſped, a plaintive tone of voice, and a ſolemn gait; a ſcrupuloſity in things indifferent, and a dogmatic and clerical manner of deciding in the common affairs of life; a ridiculous inclination to diſcover iniquity in innocent actions; to confound pleaſure with vice, and to be an enemy to joy, the greateſt boon that God has beſtowed on man; and a hundred other like fopperies there are, with which the religious make a parade, that is ſhocking both to good ſenſe and the evangelic morality, and which render their miniſtry, in the eyes of ſenſible people, more contemptible than reſpectable. Theſe are rocks on which the young theologian is much too liable to run, and of which he cannot be ſufficiently cautioned.

V. After this candid caution, and brief introduction, we paſs to the examen of the different parts, the union of which compoſes the ſyſtem of the paſtoral, the moſt important article perhaps, in all theology The deſign of Revelation was, without doubt, to conduct man by faith to a virtuous life. It is not the opinions or the learning of weak mortals that can determine their intrinſic merit; it is their wiſdom, their regularity of conduct, that muſt ſtamp their value. Experience ſhews, that a man of great genius and learning may be alſo a great villain; one who is unable to pleaſe God, or his neighbour: the virtuous Chriſtian, on the contrary, muſt be agreeable to both; it follows therefore, that the practical part of theology, which leads mankind to a virtuous conduct, is of all its parts the moſt important.

Catechetic Theology.

I. By Catechetic Theology is meant, *The art of teaching youth, and ignorant perſons, the principal points of the Evangelical Doctrine, as well with regard to belief as practice.* This application of the theoretic ſciences of theology ought to be conducted in the moſt ſimple manner poſſible. It is not every one who is poſſeſſed of the talent of properly compoſing and delivering catechetic inſtructions; and it is an art that is very neceſſary in the Chriſtian church.

II. The greateſt difficulty conſiſts in ſeparating the articles of faith that are abſolutely eſſential and indeſpenſable to the ſalvation of mankind, from thoſe that are ſubtle and ſpeculative, more liable to contradiction, and leſs neceſſary to ſuch as do not make theology their profeſſion. However, as children do not always remain children, and as the church is compoſed of perſons of both ſexes, and of all ages, it is neceſſary, that, in the explanations of the catechiſm, there ſhould be employed different degrees of ſimplicity, proportioned to the age and capacity of thoſe that are to be inſtructed. It is expedient for young people to retain in their minds the firſt principles of religion, ſuch as are contained in good catechiſms; and that they be explained to them in particular lectures; which is the moſt uſual and moſt natural method of enabling youth to give an account of their faith. The ſermons that are given in the catholic churches on controverſy, and in proteſtant churches on the catechiſm, ſerve to inſtruct thoſe who are of riper years and have their judgment more formed. Theſe ſermons compoſe, at the ſame time, a ſort of courſe of the dogmatic and the polemic theology.

III. Both in private catechiſing, and in ſermons that are purpoſely intended to explain the catechiſm, the theologian ſhould avoid, as much as poſſible, the uſe of technical terms; or (which is ſtill better) he ought to begin by explaining thoſe terms, of which he ſhould give ſuch clear and determinate definitions, that no perſon of a moderate capacity can poſſibly miſtake them. In a word, he ſhould endeavour more to prove than to perſuade; and as eloquence ſometimes perſuades at the expence of truth, he ſhould cautiouſly avoid that ſort of deluſive perſuaſion, and in its room ſubſtitute clear and ſolid argument.

IV. The catechumen ſhould not only be inſtructed in the tenets of his own religion, and the foundations on which they are built, but alſo in the dogmas of other religions, and the proofs that are brought to maintain them: for a ſubtle, deceitful and ſpecious book may fall into his hands, or he may be drawn into a diſpute with an able adverſary. It is neceſſary, therefore, that he be provided with arms offenſive and defenſive, that he may be able ſucceſsfully to defend himſelf; and, if it may be, to convert his antagoniſt, and by that mean promote the glory of truth and of religion. It is the part, therefore, of his preceptor, to teach him faithfully the principal tenets of other religions, and the arguments that are brought to defend them.

Of Casuistic Theology.

I. Happily for man, and for ſociety, all are not ſo obſtinate, or ſo inſenſible, as to aſk, *what ſort of animal conſcience is*, or never to know what is remorſe. Happily, the greateſt part of mankind are ſenſible, that all their actions are not conformable to the laws of divine wiſdom, nor to the rules of natural equity; are afflicted at their paſt conduct, and find a generous and earneſt deſire ariſe in their ſouls to avoid for the future thoſe dangerous rocks. To calm the troubled mind; to appeaſe the timorous conſcience; to communicate the conſolations of grace to the afflicted ſoul; to explain and decide in doubtful caſes; to direct thoſe that err, and to ſupport their weakneſs; to convince ſuch as perſiſt in their errors; to pierce the hardened heart; to intimidate the wicked, and to rouſe the indolent; to conduct the Chriſtians, committed to the care of their paſtor, in the way that leads to true felicity; are the important objects of caſuiſtic theology, and for which it affords the proper inſtructions.

II. In a more confined ſenſe, by caſuiſtic theology is meant, the ſcience that decides in doubtful caſes of moral

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theology, and that calms the ſcruples of conſcience which ariſe in the Chriſtian's ſoul during his ſojourn in this world.

III. The ſtudies relative to theſe objects, which the theologian is ſuppoſed to have made, and the confidence that the common rank of Chriſtians place in their paſtors, afford them the means and the opportunities of rendering ſignal ſervice to thoſe of their fellow citizens who have need of their counſel and conſolation: for where there is one man of a philoſophic ſpirit, one Chriſtian of a well-grounded knowledge in theology, there are in a ſociety a thouſand that are not, and who are yet deſirous of being inſtructed, guided, comforted, eſtabliſhed. It is therefore both juſt and important, that he who devotes himſelf to the ſervice of the altar, ſhould early ſtudy all thoſe ſciences that will enable him worthily to perform this important part of his miniſtry.

IV. God forbid, however, that we ſhould countenance the abuſe that is made, in ſome Chriſtian countries, of the duties that we have here explained. To reduce theſe matters into a political ſyſtem; to make the direction of conſciences a profeſſion, a regular trade; to provide each houſe with a ſpiritual director, as with a butcher or baker, a ſteward or porter, who by that mean may inſinuate himſelf into the confidence of families, and become the depoſitory of all their ſecrets; may ſometimes ſow diſcord between huſband and wife, or the neareſt relations; who may avail himſelf of the confidence of his devotees, to direct them conſtantly in matters of a worldly, and ſometimes even of a criminal nature; to efface the legitimate and ſacred authority of the father of a family, and, in its place, to ſubſtitute a foreign power; to undermine the confidence, the union and concord of families, in order to confirm and render neceſſary this ſecondary authority; to captivate the ſpirit, and oft-times the heart of a wife or daughter, and in general of weak minds; to enjoin them ridiculous mummeries that lead to fanaticiſm, and a thouſand dangerous ſuperſtitions, or to religious exerciſes that divert them from their domeſtic duties; in a word, to aſſume an abſolute authority over the conſciences of mankind, is a pernicious invention, contrary to the evangelic moral, to the welfare of ſociety, to the intereſt of the ſtate, and to the ſovereign authority; and well deſerves an exemplary puniſhment.

V. But the cure of ſouls, faithfully intended, and properly limited, differs totally from this deſpotic power. He, who is charged with it by a lawful vocation, ſhould remember that there are four claſſes of men with whom he will be engaged: 1. With thoſe of weak minds; of little knowledge, and little ability. 2. With thoſe whoſe ſpirits are afflicted by ſome great reverſe of fortune. 3. With thoſe of nice and timorous conſciences, who ſuffer by their ſcruples, whether they be vain or rational. 4. And laſtly, the wicked, the hardened and incorrigible ſinner. The grand art here conſiſts in repreſenting to each of theſe claſſes of men, the truth, in a manner ſo clear, ſo ſtrong and full, that they can no longer retain any doubts, that conviction muſt take place, and conſolation or converſion be the conſequence.

VI. Truth is in its nature highly problematic: each one, however, is perſuaded that he knows it, that he poſſeſſes it, and is guided by it; every man thinks himſelf in the right. We ſhould therefore begin by diſcovering the truth in the ſubject before us, and in placing it upon a ſolid foundation. This buſineſs of demonſtrating the truth to others, is attended in the mean time with infinite difficulty. Every mind is not capable of diſcovering it at the firſt glance; nor can all diſcern it from the ſame point of view. Sometimes men require conviction by abſtract or philoſophical arguments, and ſometimes by the expreſs deciſions of the Holy Scripture. Sometimes by authority, ſometimes by gentle remonſtrance, and ſometimes by dreadful menaces. Sometimes they are to be reclaimed by properly expoſing the neceſſary and fatal conſequences that reſult from their conduct; and at others, by the alluring promiſes of the Goſpel. Now vice is to be boldly confronted; and now the tranſgreſſor is to be conducted into the right path by artful turnings: now the ſinner's crimes are to be painted in the ſtrongeſt colours; and now a veil is to be lightly caſt over them; and ſometimes we ſhould even indulge a favourite inclination, in order to induce them to abandon a more pernicious paſſion: and ſo of the reſt.

VII. As it is impoſſible that the books which have been wrote on this ſubject, though of an immenſe quantity, can contain every caſe that daily occurs in the miniſtry of the Goſpel; and as theſe caſes are not always juſtly decided by theſe authors; and, if they were, the conſulting of ſuch enormous works would take up too much of a theologian's time, and divert him from his other ſtudies; and as theſe caſuiſtic writers contain, moreover, a number of puerile ſubtilties, and wretched chimeras; it is highly proper that the miniſter of the altar, whom we ſuppoſe to have a maſterly knowledge of the principles, the dogmas, and moral of the Chriſtian religion, ſhould endeavour to draw from the true ſource the means that he is to employ on each occurrence, and not have recourſe to books for their deciſions. For which purpoſe it is neceſſary, 1. That he accuſtom himſelf to reaſon according to the rules of ſound logic. 2. That he learn to know the human heart, under its different diſguiſes; the characters of men, their arts, and ruling paſſions. 3. That he do not attempt to gain or convince by little pious frauds, or by lucky ſophiſms artfully repreſented. 4. That he do not inflict what are called penances, which are the height of abſurdity. 5. That he do not enjoin mummeries, pilgrimages, auſterities, and a thouſand like matters, which can never carry with them a real conviction, and only ſerve to divert men from their labours and the duties of ſociety. But, 6. That he conſtantly preſent, as we have before ſaid, and cannot too often repeat, the truth, in all its native force and purity.

VIII. This truth, however, is no enemy to ſacred eloquence; on the contrary, the latter ſerves to introduce the former into the mind of the auditor, and there to give it ſuch ſtrong impreſſions, as neither time, the diſſipations of the world, nor the diſtractions of fortune, are able eaſily to efface. The whole miniſterial function conſiſts in teaching, preaching, adminiſtering the ſacraments of the church, viſiting the ſick and the dying, comforting the afflicted, and affording the ſpiritual aids to all thoſe who have need of them. Eloquence is of the greateſt efficacy in all theſe functions; and, without affecting it, the miniſter of the goſpel ſhould never neglect it. There are ſome profeſſors in univerſities who give their auditors a complete ſyſtematic courſe on paſtoral theology, which may be attended with many advantages.

Consistorial Prudence, *or* General Oeconomy *of the* Church.

I. Among the practical ſciences of theology, we muſt not

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not paſs over in ſilence that which is called the Conſiſtorial or Eccleſiaſtic Prudence; whoſe object is the exterior order or arrangement of the Chriſtian church, on principles founded on the Holy Scriptures; and which are proper, not only to maintain religion in its purity and ſplendor, but to defend it againſt all ſchiſms, diſſenſions and ſeparations whatever. This œconomy is neceſſary in the councils, the ſynods, the conſiſtories, and in the faculties of theology. We muſt not, however, confound this with the eccleſiaſtic juriſprudence, which is the ſcience of interpreting and applying the laws, inſtituted by the ſovereign, relative to the perſons, goods, and affairs of the church; whereas the object of conſiſtorial prudence is the arrangement of the church itſelf, and the eccleſiaſtic ſtate, on Chriſtian and rational maxims. The one is a ſort of legiſlation in itſelf; and the other, on the contrary, an application of the civil laws.

II. The theological prudence includes therefore, firſt, the whole plan of church-government, and the arrangement of the eccleſiaſtic ſtate; ſecondly, the ordinances relative to exterior ceremonies, and divine worſhip; and laſtly, the diſcipline of the church, the errors, the ſchiſms, the hereſies, and diſſenſions that ariſe among Chriſtians. The ſource of this prudence is a thorough knowledge of the eſſence of the Chriſtian religion, and the method of drawing from it juſt conſequences.

III. This diſcipline is likewiſe employed in deciding, Wherein conſiſts the difference between the clergy and the laity; or if there be, in fact, any real difference between them: if the church form a diſtinct ſtate in the general ſyſtem of government; and to whom belongs the right of deciding *circa ſacra*; and what are the limits of the ſpiritual and temporal powers in this reſpect: wherein conſiſts the hierarchy of the church, and what are its rights and privileges: to whom appertains the nomination of a prieſt, or other eccleſiaſtic, according to the divine ordinance: to whom is committed the right of preaching in public, of adminiſtering the ſacraments, and of exerciſing the excommunicative power of expelling, or again admitting, any particular Chriſtian, or even a whole country, into the pale of the church: the bans and interdicts; the exerciſe of ſacred or theologic ſtudies; the ſchools, the ſeminaries, the univerſities and academies, the claſſes, the convents; and ſo of the reſt: all ſubjects vigorouſly attacked and obſtinately defended.

IV. The conſiſtorial prudence examines likewiſe the liturgies, the ceremonies and religious cuſtoms, the breviaries, the rituals, the canticles, and other books of devotion adopted by the church; the formularies, the ſujects of diſcipline, &c. &c. the creeds, the confeſſions of faith, the catechiſms, and many other like matters; and laſtly, the doubts and objects of controverſy, that occaſion the holding of ſynods and councils; the queſtion, if the Pope be above the councils, or the councils above the Pope; the practice of elenchtic theology, or the public elenchy; the ſeparation and reunion of the church, which the Syncretiſts and Irenians diſpute; the divorces more or leſs allowable; matrimonial, and conſiſtorial matters, &c. &c.

V. All theſe ſubjects, and an infinity of others, which ariſe from, or have an immediate connection with theſe, require to be thoroughly conſidered, reduced into a regular ſyſtem, explained and fixed on ſolid principles, and confirmed by juſt and pertinent examples. From all this reſults what is called Eccleſiaſtic Prudence. This ſcience has not yet been reduced into a ſyſtem or formal diſcipline, and that principally becauſe it has been conſtantly confounded with the eccleſiaſtic law: but that in reality differs as much from this, as political prudence differs from the common law.

Of THEOLOGIC PRUDENCE *in the* DIFFERENT FUNCTIONS *of the* MINISTRY.

I. INDEPENDENT of caſuiſtical theology, and of the œconomy of the church in general, the theologian has, moreover, need of great ſagacity in the particular exerciſe of his miniſtry; and many able divines have reduced this ſcience into a ſyſtem, and have given general precepts, and particular rules, for the conduct of the miniſter of the altar, in the different circumſtances that may ariſe in this part of his duty. We ſhall decline the particular explanation of theſe different ſyſtems, as it would lead us into numberleſs *minutiæ*. *Conrad Porta* has wrote a work on the ſubject, intitled *Paſtorale Lutheri;* Stoltzelinus, Kortholt, Philip Hahn, Hartman, and many other theologians, have wrote large volumes concerning it; but, above all, the treatiſe of *Dr. John Mayer*, which is called *Muſæum Miniſtri Eccleſiæ*, is to be conſulted on this matter. We the more readily omit the names and titles of other works of this kind, as we have preſcribed it to ourſelves as a law, to avoid, as much as poſſible, theſe ſorts of citations, ſeeing that the number of new books that are continually appearing frequently ſuperſede their predeceſſors; and moreover, in this part of theology, each Chriſtian communion has its particular authors, who treat it in conformity to the dogmas and principles which that communion adopts.

II The humour of reducing every thing into ſyſtem, has alſo taken place in this matter, which in fact appears to have no occaſion for any peculiar diſcipline that could not be included under ſome other part of theology. But as this diſtinction is already made, it is our buſineſs to explain it, for the uſe of ſuch as devote themſelves to the altar. The prudential theology is, for them and their miniſtry, what political prudence is for a man of the world in the commerce of life. It is the art of attaining the end propoſed: and as each condition in life has its particular purſuits, the divines have alſo naturally theirs, and the precepts of theologic prudence ſerve to conduct them to it.

III. But as the dogmas, the ceremonies, the rites and objects that the miniſters of the different Chriſtian communions propoſe to themſelves, are by no means the ſame, each communion, each ſect, does not follow, in this reſpect, the ſame rules and precepts, nor even part of the ſame principles. All that we can therefore do amidſt this diverſity of opinions, and contrariety of maxims, is to point out, in a few words, the principal objects that one or other of them comprehend in this part of their paſtoral theology.

IV. The *Aſcetic Theology*, for inſtance, treats of the various particular exerciſes of piety; and the principles, that it propoſes with this regard, ſerve as guides to the miniſter of the altar, in his recommendation of the practice of it, as well as in many parts of his eccleſiaſtic duty. Faſts, pilgrimages, and many other matters of the ſame kind, belong to the province of aſcetic theology, and which we will not abſolutely reject, becauſe we write for readers of all ſorts of communions. Truth, however, obliges us to remark, that the aſcetic theology of every communion is the offspring of principles falſely attributed to the Goſpel, and belongs

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belongs much more properly to ſuperſtition than religion. The monaſtic life, of which there is not the leaſt trace to be found in the Holy Scriptures, and which is ſo contrary to the wiſdom and goodneſs of God; the contemplative life which is employed merely in theoretic and barren ſpeculations, and which is a continual impediment to the practice of the duties of a citizen, and of the ſocial virtues; the corporal chaſtiſements that the pious viſionary inflicts on himſelf, and a thouſand like abſurdities, are the fruits of fanaticiſm, and the eſſence of aſcetic theology

V Under this head may be alſo included, confeſſion and abſolution, which are modern inventions, and of which there is not the leaſt veſtige to be found in the Goſpel, and which were unknown to Jeſus Chriſt and his apoſtles; unleſs we would torture and diſguiſe the text, and make a ſtrange abuſe of words, and of phraſes the moſt ſimple: inventions, in ſhort, that are more politic and lucrative than divine. Be that as it may, the aſcetic theology preſcribes general maxims relative to confeſſion and abſolution, and particular precepts for the prieſts of the confeſſional.

VI. The *Paracletic Theology*, on the contrary, is totally employed in preparing conſolations againſt plagues and other public calamities and adverſities, and againſt the moſt conſiderable evils that befall individuals. It conſiders, examines, and directs theſe conſolations, and points out the proper method of applying them. As it is the buſineſs of aſcetic theology to humble and intimidate the Chriſtian, and to ſubject him to all ſorts of pious and painful bodily exerciſes, ſo it is that of paracletic theology to reanimate his courage and his faith, and to adminiſter conſolation to his ſoul.

VII. The five doctrines of which we have here treated, to wit, the Homilitic, Catechetic, and Caſuiſtic Theology, and the Conſiſtorial and Theologic Prudence in the ordinary exerciſe of the miniſtry, form therefore what is called, in a collective ſenſe, *Paſtoral Theology*; a ſcience on which many authors, of all communions, have wrote vaſt treatiſes; in which complete courſes are made at univerſities, by the faculties of theology; which is reduced into a regular ſyſtem; and which, in fact, forms not one of the leaſt parts of that ſcience which is neceſſary to an able and faithful theologian who undertakes the cure of ſouls.

VIII. We think we have ſaid enough to give an idea of thoſe ſciences that compoſe the general ſyſtem of theology. We are not ignorant, however, that there are theologies eſtabliſhed in the ſchools, ſtill different in their genus and ſpecies: that they diſtinguiſh, for example, 1. The Theology of God, (Theologia Dei), 2. That of Jeſus Chriſt, 3. That of the Holy Ghoſt, 4. That of Angels, and 5. That of Men: that they again ſub-divide the Theology of God, 1. Into *Theologia Dei naturalis*, or *eſſentialis*, by which is ſhewn, that God perceives *ſimul et ſemel*, once and for ever, all that is contained in his eſſence; and 2. *Theologia Dei idealis* or *exemplaris*, which conſiders thoſe things that muſt be revealed to mankind to work their ſalvation: this laſt article is again divided into *Archetypic Theology*, which teaches what comes, in this reſpect, immediately from God himſelf; and *Ectypic Theology*, which conſiders the theologic notions that man, as the image of God, is able to acquire by his own nature, that is, by the ability he has received from the Supreme Being, to know and adore him, and by the preaching of his divine word. But we ſhould never have done, were we to relate all the diſtinctions, diviſions, and ſubdiviſions, &c. that men, fond of ſyſtematic forms, have introduced into all the ſciences: diviſions whoſe whimſical denominations buſy and embarraſs the mind that ought to be more uſefully employed in attending to realities; and which conſtantly ſavour of that pedantry which inſinuates itſelf, more or leſs, into the ſtudy of every ſcience.

R E M

REMEMBRANCE. See MEMORY.

REMEMBRANCERS, anciently called clerks of the remembrance, certain officers in the exchequer, whereof three are diſtinguiſhed by the names of the king's remembrancer, the lord treaſurer's remembrancer, and the remembrancer of the firſt fruits. The king's remembrancer enters in his office all recognizances taken before the barons for any of the king's debts, for appearances or obſerving of orders; he alſo takes all bonds for the king's debts, &c. and makes out proceſſes thereon. He likewiſe iſſues proceſſes againſt the collectors of the cuſtoms, exciſe, and others, for their accounts; and informations upon penal ſtatutes are entered and ſued in his office, where all proceedings in matters upon Engliſh bills in the exchequer-chamber remain. His duty further is to make out the bills of compoſitions upon penal laws, to take the ſtatement of debts; and into his office are delivered all kinds of indentures and other evidences which concern the aſſuring any lands to the crown. He, every year in craſtino animarum, reads in open court the ſtatute for election of ſheriffs; and likewiſe openly reads in court the oaths of all the officers, when they are admitted.

The lord treaſurer's remembrancer is charged to make out proceſs againſt all ſheriffs, eſcheators, receivers, and bailiffs, for their accounts. He alſo makes out writs of fieri facias, and extent for debts due to the king, either in the pipe or with the auditors; and proceſs for all ſuch revenue as is due to the king on account of his tenures. He takes the account of ſheriffs; and alſo keeps a record, by which it appears whether the ſheriffs or other accountants pay their proffers due at Eaſter and Michaelmas: and at the ſame time he makes a record, whereby the ſheriffs or other accountants keep their prefixed days: there are likewiſe brought into his office all the accounts of cuſtomers, comptrolers, and accountants, in order to make entry thereof on record: alſo all eſtreats and amercements are certified here, &c.

The remembrancer of the firſt-fruits takes all compoſitions and bonds for the payment of firſt-fruits and tenths; and makes out proceſs againſt ſuch as do not pay the ſame.

REMINISCENCE, that power of the human mind, whereby it recollects itſelf, or calls again into its remembrance ſuch ideas or notions as it had really forgot; in which it differs from memory, which is a treaſuring up of things in the mind, and keeping them there, without forgetting them.

REMISSION, in phyſics, the abatement of the power or efficacy of any quality.

REMISSION, in law, &c. denotes the pardon of a crime, or the giving up the puniſhment due thereto.

RE-

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REMITTANCE, in commerce, the traffic or return of money from one place to another, by bills of exchange, orders, or the like.

REMONSTRANCE, an expoſtulation or humble ſupplication, addreſſed to a king, or other ſuperior, beſeeching him to reflect on the inconveniences, or ill conſequences of ſome order, or the like. This word is alſo uſed for an expoſtulatory counſel, or advice; or a gentle and handſome reproof, made either in general, or particular, to apprize or correct ſome fault, *&c.*

REMORA, in ichthyology. See ECHENEIS.

ACTION OF REMOVING, in Scots law. See LAW, Tit. xiii. 16.

REMPLY, in heraldry, ſomething filled up. The term is chiefly uſed to denote that the chief is quite filled up with a ſquare piece of another colour, leaving only a bordure of the proper colour of the chief about the ſaid piece. See Plate CXLVII. fig. 8.

RENAL, ſomething belonging to the reins or kidneys. See ANATOMY, p. 268.

RENCOUNTER, in the military art, an engagement of two little bodies or parties of forces; in which ſenſe it ſtands in oppoſition to a pitched battle. See BATTLE.

RENCOUNTRE, or RENCONTRE, in heraldry, is applied to animals when they ſhew the head in front, with both eyes, *&c.* or when the face ſtands right forward, as if they came to meet the perſon before them.

RENDEZVOUS, a place appointed to meet in at a certain day and hour.

RENEALMIA, in botany. See TELLANDSIA.

RENEGATE, or RENEGADO, a perſon who has apoſtatized or renounced the Chriſtian faith, to embrace ſome other religion, particularly Mahometaniſm.

RENFREW, a town of Scotland, the capital of the county of Renfrew, ſituated on the river Clyde, forty-ſix miles weſt of Edinburgh.

RENIFORM, ſomething reſembling the figure or ſhape of kidneys

RENITENCY, among philoſophers, that force in ſolid bodies, whereby they reſiſt the impulſe of other bodies, or re-act as much as they are acted on. See MECHANICS.

RENNES, a city of France, capital of the province of Britany, ſituated on the river Villaine: W. long. 1° 45′, N. lat. 48° 5′.

RENT, in law, a ſum of money, or other conſideration, iſſuing yearly out of lands or tenements.

RENVERSE', INVERTED, in heraldry, is when any thing is ſet with the head downwards, or contrary to its natural way of ſtanding. Thus, a chevron renverſé, is a chevron with the point downwards. They uſe alſo the ſame term when a beaſt is laid on its back.

RENUNCIATION, the act of renouncing, abdicating, or relinquiſhing any right, real or pretended

RENUNCIATION *by an heir*, in Scots law. See ADJUDICATION.

REPARTEE, a ready ſmart reply, eſpecially in matters of wit, humour, or raillery.

REPEALING, in law, the revoking or annulling of a ſtatute, or the like.

REPEAT, in muſick, a character ſhewing that what was laſt played or ſung muſt be repeated or gone over again.

REPELLENTS, in medicine, remedies which drive back a morbid humour into the maſs of blood from which it was unduly ſecreted.

The moſt remarkable in the claſs of repellents are the white of an egg, the lapis calaminaris, litharge of gum, red-lead, tutty, pampholix, houſe-leek, putty, and cow web.

REPETITION, the reiterating of an action.

REPETITION, in rhetoric, a figure which gracefully and emphatically repeats either the ſame word, or the ſame ſenſe in different words.

REPLETION, in medicine, a plenitude or plethora. See PLETHORA

Right of REPLEDGING, in Scots law. See *Lord of* REGALITY.

REPRESENTATION, in the drama, the exhibition of a theatrical piece, together with the ſcenes, machines, *&c.* See COMPOSITION.

REPRESENTATIVE, one who perſonates or ſupplies the place of another, and is inveſted with his right and authority. Thus the houſe of commons are the repreſentatives of the people in parliament.

REPRIEVE, in law, is ſuſpending or deferring the execution of the law upon a priſoner for a certain time; or a warrant from the king for deferring the execution of a perſon condemned.

REPRISALS, a right which princes claim of taking from their enemies any thing equivalent to what they unjuſtly detain from them.

REPROBATION, in theology, a decree by which God is ſuppoſed, either from all eternity, or from the creation of the world, to conſign over to eternal miſery the greateſt part of mankind, and to ſave none of the human race, except thoſe whom he made the heirs of glory by election.

REPROBATOR, in Scots law. See LAW, Tit. xxxi. 14.

REPRODUCTION, the act whereby a thing is produced anew, or grows a ſecond time.

The reproduction of ſeveral parts of lobſters, crabs, *&c.* is one of the greateſt curioſities in natural hiſtory. It ſeems, indeed, inconſiſtent with the modern ſyſtem of generation, which ſuppoſes the animal to be wholly formed in the egg; that, in lieu of an organical part of an animal cut off, another ſhould ariſe perfectly like it: the fact, however, is too well atteſted to be denied. The legs of lobſters, *&c.* conſiſt each of five articulations; now when any of the legs happen to break, by any accident, as by walking, *&c.* which frequently happens, the fracture is always found to be at the future near the fourth articulation; and what they thus loſe, is exactly reproduced in ſome time afterwards; that is, a part of the leg ſhoots out, conſiſting of four articulations, the firſt whereof has two claws, as before; ſo that the loſs is entirely repaired.

If the leg of a lobſter be broken off by deſign at the fourth or fifth articulation, what is thus broke off is always reproduced. But, if the fracture be made in the firſt, ſecond, or third articulation, the reproduction is not ſo certain. And it is very ſurpriſing, that, if the fracture be made at theſe articulations, at the end of two or three days all the other articulations are generally found broke off to the fourth, which, it is ſuppoſed, is done by the creature itſelf, to make the reproduction certain. The part reproduced is not only ſimilar to that retrenched, but alſo, in a certain ſpace of time, grows equal to it. Hence it is that we frequently ſee lobſters which have their two large legs unequal in all proportions; and, if the part reproduced be broken off, a ſecond will ſucceed.

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REPTILES, in natural hiſtory, a kind of animals denominated from their creeping or advancing on the belly. Or reptiles are a genus of animals and inſects, which, inſtead of feet, reſt on one part of the body, while they advance forward with the reſt.

Such are earthworms, ſnakes, caterpillars, *&c.*

REPUBLIC, commonwealth, a popular ſtate or government; or a nation where the people have the government in their own hands.

REPUBLIC *of letters*, a phraſe uſed collectively of the whole body of the people of ſtudy and learning.

REPUDIATION, in the civil law, the act of divorcing. See DIVORCE.

REPULSION, in phyſics, that property in bodies, whereby, if they are placed juſt beyond the ſphere of each other's attraction, they mutually fly from each other. See ELECTRICITY, and MECHANICS.

REQUEST, in law, a ſupplication or petition preferred to a prince, or to a court of juſtice, begging relief in ſome conſcionable caſes where the common law grants no immediate redreſs.

Court of REQUESTS, an ancient court of equity, inſtituted about the nineteenth year of Henry VII. See COURT.

In the fortieth and forty-firſt years of queen Elizabeth, it was adjudged upon ſolemn argument, in the court of common pleas, that the court of requeſt was then no court of equity.

REQUIEM, in the Romiſh church, a maſs ſung for the reſt of the ſoul of a perſon deceaſed. See MASS.

REQUISITION, in Scots law. See LAW, Tit. xv. 8.

RESARCELE'E, in heraldry, is where a ſlender croſs is charged upon another, as repreſented in Plate CXLVII. fig. 6.

RESCHET, the capital of the province of Gilan, in Perſia, ſituated on the ſouth-weſt coaſt of the Caſpian ſea.

RESCISSION, in the civil law, an action intended for the annulling, or ſetting aſide, any contract, deed, *&c.*

RESCRIPT, an anſwer delivered by an emperor, or a pope, when conſulted by particular perſons, on ſome difficult queſtion or point of law, to ſerve as a deciſion thereof.

RESEDA, in botany, a genus of the dodecandria trigynia claſs. The calix conſiſts of one deeply cut leaf; the petals are laciniated; and the capſule has one cell. There are 11 ſpecies, two of them natives of Britain, *viz.* the lutea, or baſe-rocket; and the luteola, wild woad, or dyers-weed.

RESERVATION, in law, an action or clauſe whereby ſomething is reſerved, or ſecured to one's ſelf.

Mental RESERVATION, a propoſition, which, ſtrictly taken, and according to the natural import of the terms, is falſe; but, if qualified by ſomething concealed in the mind, becomes true.

Body of RESERVE, or *Corps de* RESERVE, in military affairs, the third or laſt line of an army, drawn up for battle; ſo called becauſe they are reſerved to ſuſtain the reſt, as occaſion requires; and not to engage, but in caſe of neceſſity.

RESERVOIR, a place where water is collected and reſerved, in order to be conveyed to diſtant places through pipes, or ſupply a fountain, or jet d'eau.

RESET OF THEFT, in Scots law. See LAW, Tit. xxxiii. 29.

RESIDENT, a public miniſter, who manages the affairs of a kingdom or ſtate, at a foreign court.

They are a claſs of public miniſters inferior to ambaſſadors or envoys; but, like them, are under the protection of the law of nations.

RESIDUE, the remainder or balance of an account, debt, or any thing elſe.

RESIN See CHEMISTRY, p. 94.

RESIGNATION, in Scots law. See LAW, Tit. xiv. 7.

RESISTANCE, or RESISTING FORCE, in philoſophy, denotes, in general, any power which acts in an oppoſite direction to another, ſo as to deſtroy or diminiſh its effect. See MECHANICS, HYDROSTATICS, and PNEUMATICS.

RES JUDICATA, in Scots law. See LAW, Tit. xxxii. 4.

RES *Publica*, in Scots law. See LAW, Tit. viii. 2.

RES *Univerſitatis*, in Scots law. See LAW, *ibid.*

RES *Sacræ*, in Scots law. See LAW, *ibid.*

RESOLUTION, in chemiſtry, *&c.* the reduction of a mixed body into its component parts, or firſt principles, by a proper analyſis. See CHEMISTRY, p. 100.

RESOLUTION, in medicine, that coction or alteration of the crude peccant matter of any diſeaſe, either by the natural ſtrength of the patient, or of its own accord, or by the application of remedies, whereby its bulk, figure, coheſion, *&c.* are ſo far changed, as that it ceaſes to be morbid, and becomes laudable.

RESOLVENTS, in medicine, remedies proper to reſolve and diſſipate tumours and gatherings, to ſoften indurations, and, by their tenuity and warmth, evacuate redundant and peccant humours through the pores. Under this claſs come various unguents, emplaſters, *&c.*

RESONANCE, RESOUNDING, in muſick, *&c.* a ſound returned by the air, incloſed in the bodies of ſtringed muſical inſtruments, as lutes, *&c.* or even in the bodies of wind inſtruments, as flutes, *&c.* See MUSICK, and PNEUMATICS.

RESPIRATION, the act of reſpiring or breathing the air. See ANATOMY, p. 281.

RESPITE, in law, *&c.* ſignifies a delay, forbearance, or prolongation of time, granted any one, for the payment of a debt or the like.

RESPONDENT, in the ſchools, one who maintains a theſis, in any art or ſcience; who is thus called, from his being to anſwer all the objections propoſed by the opponent.

RESPONSE, an anſwer or reply. A word chiefly uſed in ſpeaking of the anſwers made by the people to the prieſt, in the litany, the pſalms, *&c.*

RESSAULT, in architecture, is the effect of a body which either projects or ſinks back; that is, ſtands more out or in than another, ſo as to be out of the line or level with it.

RESSORT, a French word, ſometimes uſed by Engliſh authors, to ſignify the juriſdiction of a court, and particularly one from which there is no appeal.

Thus it is ſaid, that the houſe of lords judge en dernier reſſort, or in the laſt reſſort.

REST, the continuance of a body in the ſame place, or its continual application or contiguity to the ſame parts of the ambient or contiguous bodies; and therefore is oppoſed to motion.

REST, in poetry, is a ſhort pauſe of the voice in reading, being

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being the ſame with the cæſura, which, in alexandrine verſes, falls on the ſixth ſyllable; but in verſes of ten or eleven ſyllables, on the fourth.

RESTAURATION, the act of re-eſtabliſhing or ſetting a thing in its former good ſtate.

RESTITUTION, in a moral and legal ſenſe, is reſtoring a perſon to his right; or returning ſomething unjuſtly taken or detained from him.

RESTITUTION *of medals*, or RESTITUTED MEDALS, is a term uſed by antiquaries, for ſuch medals as were ſtruck by the emperors, to retrieve the memory of their predeceſſor.

Hence, in ſeveral medals we find the letters REST. This practice was firſt begun by Claudius, by his ſtriking afreſh ſeveral medals of Auguſtus. Nero did the ſame; and Titus, after his father's example, ſtruck reſtitutions of moſt of his predeceſſors. Gallienus ſtruck a general reſtitution of all the preceding emperors, on two medals, the one bearing an altar, the other an eagle, without the REST.

RESTIVE, or RESTY, in the manege, a ſtubborn, unruly, ill-broken horſe, that ſtops, or runs back, inſtead of advancing forward.

RESTORATION, the ſame with reſtauration. See RESTAURATION.

In England, the return of king Charles II. in 1660, is, by way of eminence, called the Reſtoration; and the 29th of May is kept as an anniverſary feſtival, in commemoration of that event, by which the regal and epiſcopal government was reſtored.

RESTORATIVE, in medicine, a remedy proper for reſtoring and retrieving the ſtrength and vigour both of the body and animal ſpirits.

All under this claſs, ſays Quincy, are rather nutrimental then medicinal; and are more adminiſtred to repair the waſtes of the conſtitution, than to alter and rectify its diſorders.

RESTRICTION, among logicians, is limiting a term, ſo as to make it ſignify leſs than it uſually does.

RESTRINGENT, in medicine, the ſame with aſtringent. See ASTRINGENTS.

RESULT, what is gathered from a conference, inquiry, meditation, or the like; or the concluſion and effect thereof

RESURRECTION, in theology, riſing again from the dead; or a perſon's returning to a ſecond life, with new bodily organs, adapted to the ſtate of its new exiſtence.

One of the greateſt arguments for the truth of Chriſtianity is drawn from the reſurrection of our Saviour; the circumſtances of which are handed down to us in ſo plain and diſtinct a manner by the evangeliſts, as make the evidence of this important truth amount to a demonſtration.

Chriſtians generally believe, that at the day of judgement, the very identical body they have now, with the ſame fleſh, blood, and bones, will be raiſed from the dead.

RESUSCITATION, the ſame with reſurrection and revivification. See the preceding article.

The term reſuſcitation, however, is more particularly uſed by chemiſts, for the reproducing a mixed body from its aſhes, an art to which many have pretended, as to reproduce plants, &c. from their aſhes.

RETAIL, in commerce, is the ſelling of goods in ſmall parcels, in oppoſition to wholeſale. See COMMERCE.

RETAINER, a ſervant who does not continually dwell in the houſe of his maſter, but only attends upon ſpecial occaſions.

RETAINING FEE, the firſt fee given to a ſerjeant or counſellor at law, in order to make him ſure, and prevent his pleading on the contrary ſide.

RETALIATION, among civilians, the act of returning like for like.

RETARDATION, in phyſics, the act of diminiſhing the velocity of a moving body. See MECHANICS.

RETE MIRABILE, in anatomy, a ſmall plexus, or net-work of veſſels in the brain, ſurrounding the pituitary gland. See ANATOMY, p. 286.

RETENTION, is defined, by Mr Locke, to be a faculty of the mind, whereby it keeps, or retains, thoſe ſimple ideas it has once received, by ſenſation or reflection. See METAPHYSICS.

RETENTION is alſo uſed, in medicine, &c. for the ſtate of contraction in the ſolids or vaſcular parts of the body, which makes them hold faſt their proper contents. In this ſenſe, retention is oppoſed to evacuation and excretion.

RETIARII, in antiquity, a kind of gladiators, thus denominated from a net which they made uſe of againſt their antagoniſts, who were called ſecutores, and ſometimes mirmillones.

This net they carried under their buckler, and when opportunity ſerved, caſt it over the head of their antagoniſt, and in this condition killed him with a trident which they bore in the other hand.

RETFORD, a borough-town of Nottinghamſhire, ſituated twenty-five miles north of Nottingham. It ſends two members to parliament.

RETICULA, or RETICULE, in aſtronomy, a contrivance for the exact meaſuring the quantity of eclipſes.

The reticule is a little frame, conſiſting of thirteen fine ſilken threads, equidiſtant from each other, and parallel, placed in the focus of object-glaſſes of teleſcopes; that is, in the place where the image of the luminary is painted in its full extent: of conſequence, therefore, the diameter of the ſun or moon is hereby ſeen divided into twelve equal parts or digits; ſo that, to find the quantity of the eclipſe, there is nothing to do but to number the luminous and dark parts. As a ſquare reticule is only proper for the diameter, not for the circumference, of the luminary, it is ſometimes made circular by drawing ſix concentric equidiſtant circles. This repreſents the phaſes of the eclipſe perfectly.

Corpus RETICULARE, in anatomy. See ANATOMY, p. 255.

RETINA, in anatomy. See ANATOMY, p. 289.

RETINUE, the attendants or followers of a prince or perſon of quality, chiefly in a journey.

RETIRADE, in fortification, a kind of retrenchment made in the body of a baſtion, or other work, which is to be diſputed, inch by inch, after the defences are diſmantled. It uſually conſiſts of two faces, which making a re-entering angle, when a breach is made in a baſtion, the enemy may alſo make a retirade or new fortification behind it

RETLINGEN, an imperial city of Germany, in the circle of

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of Swabia and duchy of Wirtemberg, ſituated in E. long. 9°, N. lat. 48° 18'.

RETORT, in chemiſtry. See CHEMISTRY, p. 110.

RETRACTS, among horſemen, pricks in a horſe's feet, ariſing from the fault of the farrier in driving nails that are weak, or in driving them ill pointed, or otherwiſe amiſs.

RETRENCHMENT, literally ſignifies ſomething cut off or taken from a thing; in which ſenſe it is the ſame with ſubtraction, diminution, *&c.*

RETRENCHMENT, in the art of war, any kind of work raiſed to cover a poſt, and fortify it againſt the enemy, ſuch as faſcines loaded with earth, gambions, barrels of earth, ſand-bags, and generally all things that can cover the men and ſtop the enemy. See FORTIFICATION.

RETRIBUTION, a handſome preſent, gratuity, or acknowledgment, given inſtead of a formal ſalary or hire to perſons employed in affairs that do not ſo immediately fall under eſtimation, nor within the ordinary commerce in money.

RETROCESSION, the act of going backwards; more uſually called retrogreſſion, or retrogradation. See the next article.

RETROCESSION *of the equinox*. See ASTRONOMY, p. 562.

RETROGRADATION, the act or effect of a thing moving backwards.

Retrograde motion of the planets. See ASTRONOMY, p. 448.

RETROMINGENTS, in natural hiſtory, a claſs or diviſion of animals, whoſe characteriſtic it is that they ſtale, or make water, backwards, both male and female.

REVE, REEVE, or GREVE, the bailiff of a franchiſe, or manor, thus called, eſpecially in the weſt of England. Hence ſhire-reve, ſheriff, port-greve, *&c.*

REVEILLE, a beat of drum about break of day, to give notice that it is time for the ſoldiers to ariſe, and that the ſentries are to forbear challenging.

REVEL, a port-town of Livonia, ſituated at the ſouth entrance of the gulph of Finland: E. long. 24°, N. lat. 59°.

REVELATION, the act of revealing, or making a thing public that was before unknown: it is alſo uſed for the diſcoveries made by God to his prophets, and by them to the world; and more particularly for the books of the Old and New Teſtament. See BIBLE and RELIGION.

REVELATION *of St John*. See APOCALYPSE.

REVELS, entertainments of dancing, maſking, acting comedies, farces, *&c.* anciently very frequent in the inns of court, and in noblemens houſes, but now much diſuſed. The officer who has the direction of the revels at court, is called the maſter of the revels.

REVENUE, the annual income a perſon receives from the rent of his lands, houſes, intereſt of money in the ſtocks, *&c.*

REVENUE, in hunting, a fleſhy lump formed chiefly of a cluſter of whitiſh worms on the head of deer, ſuppoſed to occaſion their caſting their horns by gnawing them at the roots.

REVERBERATION, in phyſics, the act of a body repelling or reflecting another after its impinging thereon.

REVERBERATION, in chemiſtry, denotes a kind of circulation of the flame by means of a reverberatory. See CHEMISTRY, p. 112.

REVERBERATORY, or REVERBERATING FURNACE. See CHEMISTRY, p. 112.

REVEREND, a title of reſpect given to eccleſiaſtics.

REVERIE, the ſame with delirium, raving, or diſtraction.

It is uſed alſo for any ridiculous, extravagant imagination, action, or propoſition, a chimera or viſion. But the moſt ordinary uſe of the word, among Engliſh writers, is for a deep diſorderly muſing or meditation.

REVERSE *of a medal, coin*, &c. denotes the ſecond or back ſide, in oppoſition to the head or principal figure.

REVERSION, in Scots law. See LAW, Tit. XV. 1.

REVIVIFICATION, in chemiſtry. See RESUSCITATION.

REVOLUTION, in politics, ſignifies a grand change or turn in government. In which ſenſe, the revolution is uſed, by way of eminence, for the great turn of affairs in England, in the year 1688, when king James II. abdicating the throne, the prince and princeſs of Orange were declared king and queen of England, *&c.* In geometry, the revolution of any figure, is its motion quite round a fixed line, as an axis.

The revolution of a planet, or comet, round the the ſun, is nothing but its courſe from any point of its orbit till its return to the ſame. See ASTRONOMY.

REVULSION, in medicine, turning a flux of humours from one part to another, by bleeding, cupping, friction, ſinapiſms, bliſters, fomentations, bathings, iſſues, ſetons, ſtrong purging of the bowels, *&c.* See MEDICINE.

REYGATE, or RYGATE, a borough of Surry, twenty-two miles ſouth-weſt of London. It ſends two members to parliament.

REZANSKOI, the capital of the province of Rezan, in Ruſſia: eaſt long. 41°, north lat. 55°.

RHAGADES, in medicine, denotes chaps or clefts in any part of the body; ariſing either from any aridity of the parts, or acrimony of the humours.

RHAMNUS, in botany, a genus of the pentandria monogynia claſs. The calix is tubuloſe, the ſcales fortifying the ſtamina; it has no corolla; and the fruit is a berry. There are 20 ſpecies, none of them natives of Britain.

RHAMPHASTOS, in ornithology, a genus belonging to the order of picæ. The bill is large, convex, and ſerrated outwards; each mandible is crooked inwards at the point; the noſtrils are ſituate behind the baſe of the bill; the tongue reſembles a feather; and the feet of moſt of them are fitted for climbing. There are eight ſpecies, principally diſtinguiſhed by their colour.

RHAPSODI, *rhapſodiſts*, in antiquity, perſons who made a buſineſs of ſinging pieces of Homer's poems. Cuper informs us, that the rhapſodi were cloathed in red when they ſung the Iliad, and in blue when they ſung the Odyſſey. They performed on the theatres, and ſometimes ſtrove for prizes in conteſts of poetry, ſinging, *&c.* But there ſeems to have been other rhapſodi of more antiquity than thoſe people, who compoſed heroic poems or ſongs in praiſe of heroes and great men, and ſung their own compoſitions from town to town for a livelihood, of which profeſſion Homer himſelf is ſaid to be.

RHAPSODOMANCY, an ancient kind of divination performed by pitching on a paſſage of a poet at hazard, and reckoning on it as a prediction of what was to come to paſs.

RHAPSODY, in antiquity, a diſcourſe in verſe ſung or rehearſed by a rhapſodiſt. Others will have rhapſody to

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to ſignify a collection of verſes, eſpecially thoſe of Homer, which having been a long time diſperſed in pieces and fragments, were at length, by Piſiſtratus's order, digeſted into books called rhapſodies. Hence, among moderns, rhapſody is alſo uſed for an aſſemblage of paſſages, thoughts, and authorities, raked together from divers authors, to compoſe ſome new piece.

RHE, or Ree; a little iſland in the bay of Biſcay, near the coaſt of Aunis in France: W. long. 1° 30′, N. lat. 46° 14′.

RHEIMS, or Reims, a city of France, capital of the province of Champaie, one of the moſt elegant cities in France, ſituated ſeventy-five miles north-eaſt of Paris: E. long. 4°, N. lat. 49° 20′.

RHETERIANS, a ſect of heretics in Egypt, ſo denominated from Rhetorius their leader. The diſtinguiſhing doctrine of this hereſiarch, as repreſented by Philaſtrius, was, that he approved of all the hereſies before him, and taught that they were all in the right.

RHETORIC, the art of ſpeaking copiouſly on any ſubject, with all the advantage of beauty and force.

Lord Bacon defines rhetoric, very philoſophically, to be the art of applying and addreſſing the dictates of reaſon to the fancy, and of recommending them there ſo as to affect the will and deſires. The end of rhetoric, the ſame author obſerves, is to fill the imagination with ideas and images which may aſſiſt nature without oppreſſing it. Voſſius defines rhetoric, The faculty of diſcovering what every ſubject affords of uſe for perſuaſion. Hence, as every author muſt invent arguments to make his ſubject prevail; diſpoſe thoſe arguments, thus found out, in their proper places; and give them the embelliſhments of language proper to the ſubject; and, if this diſcourſe be intended to be delivered in public, utter them with that decency and force which may ſtrike the hearer; rhetoric becomes divided into four parts, invention, diſpoſition, elocution, and pronunciation.

Rhetoric and oratory differ from each other as the theory from the practice; the rhetorician being he who deſcribes the rules of eloquence, and the orator he who uſes them to advantage. Ordinarily however, the two are uſed indifferently for each other. See Compoſition.

RHEUM, a thin ſerous humour, occaſionally oozing out of the glands about the mouth and throat.

Rheum, in botany. See Botany, p. 642.

RHEUMATISM, in medicine. See Medicine, p. 124.

RHEXIA, in botany, a genus of the octandria monogynia claſs. The calix conſiſts of four ſegments, and the corolla of four petals inſerted into the calix; the antherae are declined; and the capſule has four cells. There are three ſpecies, none of them natives of Britain.

RHINANTHUS, in botany, a genus of the didynamia angioſpermia claſs. The calix is ſwelled, and has four ſegments; the capſule is obtuſe, compreſſed, and bilocular. There are ſix ſpecies, only one of which, *viz.* the criſtagalli, yellow rattle or cock's-comb, is a native of Britain.

RHINE, a great river riſing in the country of the Griſons, in Switzerland, and, running north, continues its courſe till it forms the lake of Conſtance: from whence it turns weſt, and having viſited Baſil, runs north, dividing Suabia from Alſatia; from thence it runs through the Palatinate and receiving the Neckar, the Maine, and the Moſelle, continues its courſe north by Mentz, &c. After entering the Netherlands at Skenkinchans, it is divided into ſeveral channels, the two largeſt whereof obtain the names of the Lech and the Waal, which running through the United Provinces diſcharge themſelves into the German ſea below Rotterdam.

Rhine *lower circle* conſiſts of the Palatinate of the Rhine and the three eccleſiaſtical electorates, *viz.* thoſe of Cologn, Mentz, and Triers.

Rhine *upper circle* conſiſted of the Landgraves of Alſatia and Heſſe, comprehending the Wetteraw: but only Heſſe can be accounted a part of Germany at preſent, France having united Alſace to that kingdom.

RHINEBURG, a town of Germany, in the circle of the lower Rhine and electorate of Cologn, ſituated fifteen miles eaſt of Gelder.

RHINEFIELD, the name of two towns of Germany, one whereof is ſituated in the circle of Suabia, on the Rhine, eight miles eaſt of Baſil; the other is the capital of the county of Rhinefield, ſituated in the circle of the Upper Rhine, ſixteen miles north-weſt of Mentz.

RHINOCEROS, in zoology a genus of quadrupeds belonging to the order of belluæ, of which there is but one ſpecies, *viz.* the unicornis, a native of Africa and India. It has two fore-teeth in each jaw, ſituate at a great diſtance from each other, and blunt, and a ſolid conical horn upon the noſe. This, of all quadrupeds, approaches neareſt to the elephant in ſize, the body being nearly as bulky, but the legs much ſhorter. A full-grown rhinoceros is fourteen feet high; and the legs are ſo ſhort with all this height, that the belly comes near the ground: the head is very large and oblong, of an irregular figure, broad at top, and depreſſed towards the ſnout: the ears reſemble thoſe of a hog: the eyes are very ſmall, and ſituated at a ſmall diſtance from the extremity of the ſnout: on the upper part of the ſnout, near the extremity, ſtands the horn, growing to about two feet and a half in length, bent a little back, of a black colour, and vaſtly firm and hard: the ſkin is remarkably thick and hard, ſo that the creature could not turn its body in any direction but for the joints and folds in it: the tail is ſhort, and furniſhed with ſome long and extremely thick black hairs. The rhinoceros feeds upon thorns and bruſhwood; like the ſow, he wallows in the mire. He is gentle and inoffenſive, except when he is injured. But, when irritated, he even overturns large trees in his fury.

Rhinoceros bird. See Buceros.

RHIZOPHORO, in botany, a genus of the dodecandria monogynia claſs. Both calix and corolla conſiſt of four ſegments; and there is but one long ſeed, fleſhy at the baſe. The ſpecies are ſeven, none of them natives of Britain.

RHODES, the capital of an iſland of that name, ſituated in the Mediterranean ſea, in E. long. 28°, and between 36° and 37° N. lat.

RHODIOLA, in botany, a genus of the dioecia enneandria claſs. The calix of the male conſiſts of four ſegments, and the corolla of four petals; the calix of the female has four ſegments; it has no corolla, but four nectaria, and four piſtils; and it has four capſules, containing many ſeeds. There is but one ſpecies, *viz.* the roſea, or roſe-wort, a native of Britain

RHODODENDRUM, in botany, a genus of the decandria

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dria monogynia claſs. The calix has five ſegments; the corolla is ſomewhat funnel-ſhaped; the ſtamina are declined; and the capſule has five cells. There are ſix ſpecies, none of them natives of Britain.

RHOMBOIDES, in geometry, a quadrilateral figure whoſe oppoſite ſides and angles are equal, but is neither equilateral nor equiangular.

RHOMBOIDES, in anatomy. See ANATOMY, p. 193.

RHOMBOIDIA, in natural hiſtory, the name of a genus of ſpars, given them from their being of a rhomboidal form.

RHOMBUS, in geometry, an oblique-angled parallelogram, or a quadrilateral figure whoſe ſides are equal and parallel, but the angles unequal, two of the oppoſite ones being obtuſe, and the other two acute

RHOMBUS, in ichthyology. See PLEURONECTES.

RHONE, one of the largeſt rivers in France; which riſing in one of the Alps of Switzerland, paſſes through the lake of Geneva, viſits that city, and then runs ſouth-weſt to Lyons, where joining the river Soane, it continues its courſe due ſouth, paſſing by Orange, Avignon, and Arles, and falls into the Mediterranean a little weſtward of Marſeilles.

RHUBARB. See BOTANY, p. 642.

RHUMB, RUMB, or RUM, in navigation, a vertical circle of any given place, or the interſection of ſuch a circle with the horizon; in which laſt ſenſe, rhumb is the ſame with a point of the compaſs. See NAVIGATION.

RHUMB LINE, is alſo uſed for the line which a ſhip deſcribes when ſailing in the ſame collateral point of the compaſs, or oblique to the meridians. See NAVIGATION.

RHUS, in botany, a genus of the pentandria trigynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; and the berry contains but one ſeed. The ſpecies are 16, none of them natives of Britain.

RHYME, in poetry, the ſimilar ſound, or cadence and termination of two words which end two verſes, *&c.* Or rhyme is a ſimilitude of ſound between the laſt ſyllable or ſyllables of a verſe, ſucceeding either immediately, or at a diſtance of two or three lines.

There is no rule in poetry, ſays Du Bos, whoſe obſervance coſts ſo much trouble, and is productive of leſs beauties in verſe, than that of rhyming. Rhyme frequently maims, and almoſt always enervates the ſenſe of the diſcourſe; for one bright thought which the paſſion of rhyming throws in our way by chance, is, without doubt, every day the cauſe of a hundred others that people would bluſh to make uſe of were it not for the richneſs or novelty of the rhyme with which theſe thoughts are attended.

RHYTHM, in muſick, the variety in the movement, as to the quickneſs or ſlowneſs, length or ſhortneſs, of the notes. Or it may be defined more generally, the proportion which the parts of the motion have to each other. See MUSICK.

RIBBAN, or RIBBON, in heraldry, the eighth part of a bend, like that repreſented in Plate CXLVII. fig. 10.

RIBBAND, or RIBBON, a narrow ſort of ſilk, chiefly uſed for head-ornaments, badges of chivalry, *&c.*

RIBES, in botany, a genus of the pentandria monogynia claſs. It has five ſtamina, and five petals, both inſerted into the calix; the ſtylus is bifid, and the berry contains many ſeeds. There are eight ſpecies, three of them natives of Britain, *viz.* the rubrum, or currants; the alpinum, or ſweet mountain currants; and the nigrum, or black currants.

RIBS, in anatomy. See ANATOMY, p. 173.

RICCIA, in botany, a genus of the cryptogamia algæ claſs. There are four ſpecies, all natives of Britain.

RICE, in botany. See ORYZA.

RICHARDIA, in botany, a genus of the hexandria monogynia claſs. The calix has ſix ſegments, and the corolla one ſubcylindrical petal; and the ſeeds are three. There is but one ſpecies, a native of Vera Crux.

RICHLIEU, a town of France, in the province of Orleanois and territory of Poictou, ſituated twenty-ſix miles north of Poictiers.

RICHMOND, a village in the county of Surry, ten miles weſt of London, formerly the reſidence of the kings of England.

RICHMOND is alſo a borough town of Yorkſhire, thirty-three miles north-weſt of York. It ſends two members to parliament.

RICINUS, in botany, a genus of the monœcia monadelphia claſs. The calix of the male has five ſegments; it has no corolla, but the ſtamina are numerous: The calix of the female has three ſegments; it has no corolla; the ſtyli are three, and bifid; and the capſule has three cells, and one ſeed. There are three ſpecies, none of them natives of Britain.

RICKETS, in medicine. See MEDICINE, p. 169.

RIDGE, in agriculture, a long piece of riſing land, between two furrows. See AGRICULTURE, p. 57.

RIDGLING, or RIDGEL, among farriers, *&c.* the male of any beaſt that has been but half gelt.

RIDICULE, in matters of literature, is that ſpecies of writing, which excites contempt with laughter.

RIDING, a diviſion of Yorkſhire; of which there are three, *viz.* the eaſt, weſt, and north ridings.

In all indictments in that county, both the town and riding muſt be expreſſed.

RIEF, in Scots law. See ROBBERY.

RIGA, a port-town of Livonia, one of the beſt harbours and trading towns in the Baltic: E. long. 24°, N. lat. 57°.

RIGGING *of a ſhip*, is all her cordage and ropes, belonging to her maſts, yards, *&c.*

RIGHT, in geometry, ſignifies the ſame with ſtraight: thus, a ſtraight line is called a right one.

RIGIDITY, in phyſics, denotes a brittle hardneſs. It is oppoſed to ductility, malleability, and ſoftneſs.

RIGOR, in medicine, a convulſive ſhuddering, from ſevere cold, an ague-fit, or other diſorder.

RIMINI, a port-town of Italy, in the territories of the pope, and province of Romania, ſituated on the gulph of Venice: E. long. 13° 30′, and N. lat. 44° 8′.

RIND, the ſkin of any fruit that may be cut off or pared.

Rind is alſo uſed for the inner bark of trees, or that whitiſh ſoft ſubſtance which adheres immediately to the wood.

RING, an ornament of gold, ſilver, *&c.* made of a circular form, and generally worn on the finger.

RING-BONE, in farriery, a hard callous ſubſtance, growing in the paſtern of a horſe, above the coronet: it is thus called from its growing quite round like a ring. See FARRIERY.

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RIO GRANDE, a river of Terra Firma, which riſing almoſt under the equator, and running north, falls into the north ſea between Carthagena and St Martha.

RIO GRANDE is alſo a river of Africa, which runs from eaſt to weſt through Negroland, and falls into the Atlantic ocean, in 11° N. lat.

RIO JANEIRO, a river of South America, which riſes in the mountains weſt of Brazil, and falls into the Atlantic ocean almoſt under the tropic of capricorn.

RIOT, in law, is where three or more perſons, aſſembled together, commit ſome unlawful act, with force and violence, to the diſturbance of the peace; as beating ſome perſon, forcibly entering upon the poſſeſſion of the lands, houſes, *&c.* of another, or breaking down incloſures, houſes, *&c.*

By ſtat. 1. Geo. I. cap. v. if any perſons to the number of twelve or more, unlawfully and riotouſly aſſembled, continue together for an hour, after being required, by a juſtice of the peace, or other magiſtrate, to diſperſe, they ſhall be deemed guilty of felony without benefit of clergy. However, proſecutions upon this ſtatute, muſt be begun within one year after the offence is committed.

RIPPON, a borough-town of Yorkſhire, twenty-one miles north-weſt of York. It ſends two members toparliament.

RISK, in gaming, *&c.* See CHANCE.

RITE, among divines, denotes the particular manner of celebrating divine ſervice, in this or that country.

RITORNELLO, or REPEAT, in muſick, the burden of a ſong, or the repetition of the firſt or other verſes of a ſong at the end of each ſtanza or couplet.

RITUAL, a book directing the order and manner to be obſerved in celebrating religious ceremonies, and performing divine ſervice in a particular church, dioceſe, order, or the like.

RIVAL, a term applied to two or more perſons, who have the ſame pretenſions, and which is properly applied to a competitor in love, and figuratively to an antagoniſt in any other purſuit.

RIVER, a current or ſtream of freſh water flowing in a bed or channel from its ſource into the ſea.

The great as well as the middle-ſized rivers proceed either from a confluence of brooks and rivulets, or from lakes; but no river of conſiderable magnitude flows from one ſpring, or one lake, but is augmented by the acceſſion of others. Thus the Wolga receives above two hundred rivers and brooks before it diſcharges itſelf into the Caſpian Sea; and the Danube receives no leſs, before it enters the Euxine Sea.

RIVINIA, or RIVINA, in botany, a genus of the tetrandria monogynia claſs. The corolla conſiſts of four permanent petals; it has no calix; and the berry contains one rough ſeed. There are two ſpecies, none of them natives of Britain.

RIVULET, a diminutive of river. See RIVER.

ROACH, in ichthyology. See CYPRINUS.

ROANOAK, an iſland in North America, near the coaſt of Albermarle-county, in North Carolina: W. long. 75°, N. lat. 35° 40′.

ROB, in pharmacy, the juices of fruits purified and inſpiſſated till it is of the conſiſtence of honey.

Rob of alder-berries is thus prepared: Take two quarts of the juice of ripe alder-berries, and half a pound of refined ſugar. Evaporate over a gentle fire, or in a water bath, till it is of a due conſiſtence.

ROBBERY, in law, a felonious taking away anothers man's goods, from his perſon, preſence, or eſtate, by putting him in fear. See LAW, Tit. xxxiii. 30.

ROBINIA, in botany, a genus of the diadelphia decandria claſs. The vexillum is open, reflected, and roundiſh; the calix has four teeth, the uppermoſt being emarginated. There are ſix ſpecies, none of them natives of Britain.

ROBORANTS, in pharmacy, medicines which ſtrengthen the parts, and give new vigour to the conſtitution.

ROCHEFOUCAUT, a town of Orleanois, in France, fifteen miles eaſt of Angouleſme.

ROCHELLE, a city and port-town of Orleanois, in France: W. long. 1° 5′, N. lat. 46° 7′.

ROCHESTER, a city of Kent, ſituated on the river Medway, thirty miles eaſt of London, and twenty-two weſt of Canterbury.

ROCHFORD, a market-town of Eſſex, thirty-three miles eaſt of London, and fifteen ſouth-eaſt of Chelmsford.

ROCHFORT, a port-town of Guienne, in France, twenty-three miles ſouth of Rochelle: W. long. 1°, N. lat. 46°. It is one of the ſtations of the French navy, having a commodious harbour, well ſecured by forts and batteries.

ROCK, a large maſs or block of hard ſtone rooted in the ground.

ROCK-*cryſtal*, otherwiſe called ſprig-cryſtal, in natural hiſtory, a name given to the third order of cryſtals, from their being affixed to a rock or other ſolid body.

This kind of cryſtal is the moſt common of all others, and is what the generality of authors deſcribe under the name of cryſtal of the ſhops, being that kept for medicinal purpoſes.

The cleareſt, pureſt, and moſt tranſparent that can be had, ought to be choſen; and to prove its genuineneſs, it may be tried with aqua fortis, true cryſtal making no effervescence with that menſtruum.

ROCKET, an artificial fire-work, conſiſting of a cylindrical caſe of paper, filled with a compoſition of certain combuſtible ingredients; which, being tied to a ſtick, mounts into the air, to a conſiderable height, and there burſts.

ROCKINGHAM, a market-town of Northamptonſhire, ſituated nineteen miles north of Northampton.

ROD, a land meaſure of ſixteen feet and a half: the ſame with perch and pole.

Black ROD, a ſtaff carried by the king's gentleman-uſher, as a badge of his office; this rod or ſtaff is black, and has a lion in gold on its top. See USHER.

Fiſhing ROD, a long taper rod or wand, to which the line is faſtened for angling.

ROE, the ſpawn or ſeed of fiſh. That of the male fiſhes is uſually diſtinguiſhed by the name of ſoft roe, or milt; and that of the female, by hard roe, or ſpawn.

So inconceivably numerous are theſe ovula, or ſmall eggs, that M. Petit found 342144 of them in a carp of eighteen inches: but M. Leewenhoeck found in a carp no more than 211629. This laſt gentleman obſerves, that there are four times this number in a cod, and that a common one contains 9344000 eggs.

ROE, in zoology. See CERVUS.

ROELLA,

ROELLA, in botany, a genus of the pentandria monogynia claſs. The corolla is funnel-ſhaped; the ſtigma is bifid; and the capſule is cylindrical, and has two cells. The ſpecies are two, none of them natives of Britain.

ROER, the name of two rivers in Germany, one of which riſes on the confines of Heſſe, and falls into the Rhine, a little below Duyſburg; the other riſes in the duchy of Juliers, and falls into the Maeſe at Roermond.

ROGA, in antiquity, a preſent which the emperors made to the ſenators, magiſtrates and even to the people; and the popes or patriarchs to their clergy.

Theſe rogæ were diſtributed by the emperors on the firſt day of the year, on their birth day, or on the natalis dies of the cities; and by the popes and patriarchs, in paſſion-week.

Roga is alſo uſed for the common pay of the ſoldiers.

ROGATION, in the Roman juriſprudence, a demand made by the conſuls or tribunes of the Roman people, when a law was propoſed to be paſſed. Rogatio is alſo uſed for the decree itſelf made in conſequence of the peoples giving their aſſent to this demand, to diſtinguiſh it from a ſenatus-conſultum, or decree of the ſenate.

ROGATION WEEK, the week immediately preceding Whitſunday, ſo called from the three faſts therein, on Monday, Tueſday, and Wedneſday, which are alſo called rogations, or rogation days, from the extraordinary prayers and ſupplications at this time offered to God by devout Chriſtians to appeaſe his anger and deprecate his judgments.

ROGUE, in law, an idle ſturdy beggar; who by ancient ſtatutes is for the firſt offence called a rogue of the firſt degree, and puniſhed by whipping, and boring through the griſtle of the right ear with a hot iron; and for the ſecond offence, is termed a rogue of the ſecond degree, and, if above eighteen years of age, ordered to be executed as a felon.

ROHAN, a town of France, in the province of Britany, ſituated twenty miles north of Vannes.

ROLL, in manufactories, ſomething wound and folded up in a cylindrical form.

ROLL, in law, ſignifies a ſchedule or parchment which may be rolled up by the hand into the form of a pipe.

Muſter ROLL, that in which are entered the ſoldiers of every troop, company, regiment, *&c.*

ROLLS-OFFICE, is an office in Chancery-lane, London, appointed for the cuſtody of the rolls and records in chancery.

ROLLS *of parliament*, are the manuſcript regiſters, or rolls of the proceedings of our ancient parliaments, which, before the invention of printing, were all engroſſed on parchment, and proclaimed openly in every county. In theſe rolls are alſo contained a great many deciſions of difficult points of law, which were frequently in former times referred to the deciſion of that high court.

ROLL, or ROLLER, is alſo a piece of wood, iron, braſs, *&c.* of a cylindrical form, uſed in the conſtruction of ſeveral machines, and in ſeveral works and manufactures.

ROMAN, in general, ſomething belonging to the city of Rome. See ROME.

King of the ROMANS, in modern hiſtory, is a prince elected to be ſucceſſor to the reigning emperor of Germany.

ROMANCE, in matters of literature, a fabulous relation of certain adventures deſigned for the entertainment and inſtruction of the readers.

The true nature and genuine characteriſtics of this ſpecies of writing are excellently explained by the ingenious author of the Rambler; who obſerves, that the works of fiction, with which the preſent generation ſeems more particularly delighted, are ſuch as exhibit life in its true ſtate, diverſified only by the accidents that daily happen in the world, and influenced by thoſe paſſions and qualities which are really to be found in converſing with mankind.

ROMANIA, a province of the pope's territories in Italy, including the Bologneſe and Ferrareſe. See BOLOGNA and FERRARA.

ROMANIA, is alſo the modern name of ancient Thrace, which now makes a province of Turky in Europe; lying weſtward of the Propontis, between the Euxine ſea and the Archipelago.

ROME, the capital of the pope's territories and of Italy, and anciently the miſtreſs of the Roman Empire: E. lon. 13°, N. lat. 41° 45'.

Rome is ſtill a large and fine city, though not to be compared to ancient Rome; the ſtreets are ſpacious, and magnificently built; it has five bridges over the Tiber, twenty gates, three hundred churches, and a vaſt number of palaces, convents, triumphal arches, pillars, obeliſks, ſtatues, theatres, *&c.*

ROMNEY, a borough town of Kent, and one of the cinque ports, ſituated twelve miles ſouth-weſt of Dover. It ſends two members to parliament.

ROMPEE, or ROMPU, in heraldry, is applied to ordinaries that are repreſented as broken, and to chevrons, bends, or the like, whoſe upper points are cut off. See Plate CXLVII. fig. 11.

RONDELETIA, in botany, a genus of the pentandria monogynia claſs. The corolla is funnel ſhaped; and the capſule has two cells, containing many round coronated ſeeds. There are two ſpecies, none of them natives of Britain.

ROOD, a quantity of land equal to forty ſquare perches, or the fourth part of an acre.

ROOF, in architecture, the uppermoſt part of a building. See ARCHITECTURE, p. 361.

ROOK, in ornithology. See CORVUS.

ROOM, a chamber, parlour, or other apartment, in a houſe. See ARCHITECTURE, p. 359.

ROOT, among botaniſts, denotes that part of a plant which imbibes the nutritious juices of the earth, and tranſmits them to the other parts. See AGRICULTURE, p. 42.

ROOT, in algebra and arithmetick. See ALGEBRA, p. 84. *&c.* and ARITHMETICK, p. 420.

ROPE, hemp, hair, *&c.* ſpun out into a thick yarn, and then ſeveral ſtrings of this yarn twiſted together by means of a wheel. When made very ſmall, it is called a cord; and when very thick, a cable.

ROPE-YARN, among ſailors, is the yarn of any rope untwiſted, but commonly made up of junk; its uſe is to make ſinnet, mats, *&c.*

ROSA, in botany, a genus of the icoſandria polygamia claſs. The petals are five; the calix has five fleſhy ſegments; and the ſeeds are numerous, rough, and inſerted into the interior ſide of the calix. There are 14 ſpecies, five of them natives of Britain, *viz.* the eglanteria, or ſweet briar; the ſpinoſiſſima, or burnet roſe; the arvenſis, or white-flowered dogs-roſe; the villoſa, or apple-roſe; and the canina, or red flowered dogs-roſe, or hip-tree.

ROSA-

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ROSACEOUS, among botaniſts, an appellation given to ſuch flowers as are compoſed of ſeveral petals or leaves, diſpoſed in a ſort of circular form, like thoſe of the roſe.

ROSARY, among the Roman-catholics. See CHAPLET.

ROSCOMMON, a county of Ireland, bounded by Letrim on the north, and Galway on the ſouth.

ROSE, in botany. See ROSA.

ROSE-NOBLE, an ancient Engliſh gold-coin, firſt ſtruck in the reign of Edward III. It was formerly current at 6s. 8d. and ſo called becauſe ſtamped with a roſe.

ROSMARINUS, in botany, a genus of the diandria monogynia claſs. The corolla is unequal, and the upper lip of it is ſplit into two ſegments; the filaments are long, crooked, and ſimple. There is but one ſpecies, *viz.* the officinalis, a native of Spain.

Roſemary is a very valuable cephalic, and is good in all diſorders of the nerves, and in hyſteric and hypochondriac diſeaſes. It is good in palſies, apoplexies, epilepſies, and vertigoes.

ROSIENNE, a town of Samogitia, in Poland: E. long. 23° 30′, N. lat. 55° 50′.

ROSIN. See RESIN.

ROSS, a county of Scotland, bounded by Sutherland on the north, by the German ſea and the Murray frith on the eaſt and ſouth, and by Inverneſs-ſhire and the weſtern ocean on the ſouth and weſt.

Ross is alſo a market-town, ſituated on the river Wye, eleven miles ſouth of Hereford,

ROSSE, a port-town of Ireland, twenty-two miles weſt of Kinſale.

ROS-SOLIS, SUN-DEW, an agreeable ſpirituous liquor, compoſed of burnt brandy, ſugar, cinnamon, and milk-water; and ſometimes perfumed with a little muſk: it is ſo called, as being at firſt prepared wholly of the juice of the plant ros-ſolis, or droſera. See DROSERA.

ROSTOCK, an imperial city of Lower Saxony, ſituated on a bay of the Baltic ſea: E. long. 12° 15′, and N. lat. 54° 20′.

ROSTOF, or ROSTOVA, the capital of a territory of the ſame name, in Ruſſia: E. lon. 40°, and N. lat. 57° 20′.

ROSTRA, in antiquity, a part of the Roman forum, wherein orations, pleadings, funeral harangues, &c. were delivered

ROSTRUM literally denotes the beak or bill of a bird; and hence it has been figuratively applied to the beak, or head of a ſhip.

ROSYCRUCIANS, ROSICRUCIANS, or *brothers of the roſy croſs*, a name aſſumed by a ſect or cabal of hermetical philoſophers, who appeared, or at leaſt were firſt taken notice of, in Germany, in the beginning of the XVIth century. They pretended to be maſters of all ſciences, and to have many important ſecrets, particularly that of the philoſophers ſtone.

Their ſociety is frequently denoted by the abbreviatures F.R.C.

ROT, a diſeaſe incident to ſheep, ariſing from wet ſeaſons, and too moiſt paſture. It is a very hard thing to prevent the rot, if the year prove very wet, eſpecially in May and June. Salt-marſhes, and lands where broom grows, are the beſt places of preſervation for them. Sheep are ſometimes all cleared of the rot, when not too far gone with it, only by removing them into broom-fields. Scurvy-graſs, muſtard, parſley, and thyme, are alſo good for the prevention of it.

ROTA, the name of an eccleſiaſtical court at Rome, compoſed of twelve prelates, whereof one muſt be a German, another a Frenchman, and two Spaniards; the other eight are Italians, three of whom muſt be Romans, and the other five a Bologneſe, a Ferraran, a Milaneſe, a Venetian, and a Tuſcan.

This is one of the moſt auguſt tribunals in Rome, which takes cognizance of all ſuits in the territory of the church, by appeal; as alſo of all matters beneficiary and patrimonial.

ROTATION, in geometry, a term chiefly applied to the circumvolution of any ſurface round a fixed and immoveable line, which is called the axis of its rotation: and by ſuch rotations it is, that ſolids are conceived to be generated.

ROTHERAM, a market-town of Yorkſhire, 35 miles ſouth-weſt of York.

ROTHSAY, a parliament-town of Scotland, in the iſle of Bute: W. long. 5°, and N. lat. 55° 50′.

ROTONDO, or ROTUNDO, in architecture, an appellation given to any building that is round both within and without ſide, whether it be a church, a ſalon, or the like. The moſt celebrated rotondo of the ancients, is the pantheon at Rome.

ROTTENNESS. See PUTREFACTION.

ROTTERDAM, a city of the province of Holland, ſituated on the north bank of the Maeſe, thirty miles ſouth of Amſterdam, and thirteen miles ſouth-eaſt of the Hague: E. long. 4° 20′, and N. lat. 52°.

ROTULA, in anatomy, See ANATOMY, p. 185.

ROTUNDUS, in anatomy, a name given to ſeveral muſcles. otherwiſe called teres.

ROUEN, a city of France, and capital of Normandy, ſituated on the north ſide of the Seyne, ſixty-five miles north of Paris, and forty-five miles ſouth-eaſt of Havre de Grace and the Britiſh channel: E. long. 1° 6′, N. lat 49° 30′.

ROVIGO, the capital of the Poleſin de Rovigo, in Italy, ſubject to Venice: E. long. 12° 25′, N. lat 45° 6′.

ROUND-HOUSE, a kind of priſon, for the nightly watch in London to ſecure diſorderly perſons, till they can be carried before a magiſtrate.

ROUND-HOUSE, in a ſhip, the uppermoſt room, or cabbin, on the ſtern of a ſhip, where the maſter lies.

ROUNDELAY, a kind of ancient poem thus termed, according to Menage, from its form, becauſe it turns back again to the firſt verſe, and thus goes round. This poem is little known among us, but is very common among the French, who call it rondeau It conſiſts commonly of thirteen verſes, eight whereof are in one rhime, and five in another. It is divided into couplets, at the end of the ſecond and third whereof the beginning of the roundelay is repeated; and that if poſſible in an equivocal or pauſing ſenſe.

ROUSILLON, formerly a province of Spain, now united to France, is bounded by Languedoc on the north, by the Mediterranean ſea on the eaſt, by Catalonia on the ſouth, and by the Pyrenean mountains on the weſt, being about fifty-five miles long, and thirty-ſix broad.

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ROUTE, a public road, highway, or courſe, eſpecially that which military forces take. This word is alſo uſed for the defeat and flight of an army.

ROUT, in law, is applied to an aſſembly of perſons, going forcibly to commit ſome unlawful act, whether they execute it or not.

ROWEL, among farriers, a kind of iſſue, made by drawing a ſkain of ſilk, thread, hair, or the like, through the nape of the neck, or other part of a horſe; anſwering to what in ſurgery is called a ſeton. See FARRIERY.

ROXBURGH, the name of a county in Scotland, which ſends one member to parliament.

ROXENT CAPE, or ROCK *of Liſbon*, a mountain and remarkable promontory in Portugal, ſituated in the Atlantic ocean, at the north entrance of the river Tagus, twenty-two miles north of Liſbon.

ROYAL, ſomething belonging to a king: thus we ſay, royal family, royal aſſent, royal exchange, *&c.*

ROYAL-*oak*, a fair ſpreading tree at Boſcobel, in the pariſh of Donnington in Staffordſhire, the boughs whereof were once covered with ivy; in the thick of which king Charles II. ſat in the day time with colonel Careleſs, and in the night lodged in Boſcobel houſe: ſo that they are miſtaken who ſpeak of it as an old hollow oak, it being then a gay flouriſhing tree, ſurrounded with many more. The poor remains thereof are now fenced in with a handſome wall, with this inſcription over the gate in gold-letters: *Fæliciſſimam arborem quam in aſylum potentiſſimi regis* Caroli II. *Deus op. max. per quem reges regnant, hic creſcere voluit*, &c.

ROYAL-*ſociety*. See SOCIETY.

ROYALTIES, the rights of the king, otherwiſe called the king's prerogative, and the regalia. See PREROGATIVE, and REGALIA.

ROYENA, in botany, a genus of the decandria digynia claſs. The calix is urceolated; the corolla conſiſts of one petal, bent back at the edge; the capſule has one cell, and four valves. There are three ſpecies, all natives of the Cape of Good Hope.

ROYSTON, a market-town, ſituated in the counties of Hertford and Cambridge, thirty-eight miles north of London.

RUBELLIO, in ichthyology. See CYPRINUS.

RUBETA, in zoology. See RANA.

RUBIA, in botany, a genus of the tetrandria monogynia claſs. The corolla conſiſts of one bell-ſhaped petal; and the berry contains one ſeed. There are two ſpecies, none of them natives of Britain.

RUBIGALIA, in antiquity, a feaſt celebrated by the Romans, in honour of the god Rubigus, or the goddeſs Rubigo, to engage theſe deities to preſerve the corn from blights and mildews.

RUBIGO, a diſeaſe incident to corn, commonly called Mildew, being a ſpecies of blight. See BLIGHT.

RUBININSKA, one of the northern provinces of Ruſſia, bounded by the province of Dwina on the north, by Syrianes on the eaſt, by Belozero on the ſouth, and by the lake of Onega on the weſt.

RUBRIC, in the canon-law, ſignifies a title or article in certain ancient law-books; thus called becauſe written, as the titles of the chapters in our ancient Bibles are, in red letters.

RUBUS, in botany, a genus of the icoſandria polygynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; and the berry has many ſeeds. There are 13 ſpecies, five of them natives of Britain, *viz.* the idæus, or raſpberry-buſh; the cæſius, or ſmall bramble; the fruticoſus, or common bramble; the ſaxatilis, or ſtone-bramble; and the chamæmorus, or cloud-berries.

RUBY, in natural hiſtory, a ſpecies of gems, being a beautiful gem of a red colour with an admixture of purple.

This, in its moſt perfect and beſt coloured ſtate, is a gem of prodigious beauty and extreme value; it is often found perfectly pure and free from blemiſhes or foulneſs, but much more frequently debaſed greatly in its value by them, eſpecially in the larger ſpecimens. It is of very great hardneſs, equal to that of the ſapphire, and ſecond only to the diamond. It is various in ſize, but leſs ſubject to variations in its ſhape than moſt of the other gems. It is uſually found very ſmall, its moſt common ſize being equal to that of the head of the largeſt ſort of pins; but it is found of four, eight, or ten carats, and ſometimes, though very rare, up to twenty, thirty, or forty. It is never found of an angular or cryſtalliform ſhape, but always of a pebble-like figure, often roundiſh, ſometimes oblong and much larger at one end than at the other, and in ſome form reſembling a pear, and is uſually flatted on one ſide. It commonly is naturally ſo bright and pure on the ſurface, as to need no poliſhing; and when its figure will admit of being ſet without cutting, it is often worn in its rough ſtate, and with no other than its native poliſh.

We have the true ruby only from the Eaſt Indies; and the principal mines of it are in the kingdom of Pegu and the iſland of Ceylon.

RUBY, in heraldry, denotes the red colour wherewith the arms of noblemen are blazoned; being the ſame which, in the arms of thoſe not noble, is called, gules. See GULES.

RUCTATION, a ventoſity ariſing from indigeſtion, and diſcharging itſelf at the mouth with a very diſagreeable noiſe.

RUDBECKIA, in botany, a genus of the ſyngeneſia polygamia fruſtranea claſs. The receptacle is conical and paleaceous; the pappus has four teeth on its edge; and the calix conſiſts of a double row of ſcales. There are ſix ſpecies, none of them natives of Britain.

RUDDER, in navigation, a piece of timber turning on hinges in the ſtern of the ſhip, and which, oppoſing ſometimes one ſide in the water and ſometimes another, turns or directs the veſſel this way or that. See SHIP.

RUDENTURE, in architecture, the figure of a rope or ſtaff, ſometimes plain, ſometimes carved, with which the third part of flutings of columns are frequently filled up.

RUDIARUS, in antiquity, a veteran gladiator who had got a diſcharge from the ſervice.

RUDIMENTS, the firſt principles or grounds of any art or ſcience, called alſo the elements thereof.

RUE, in botany. See RUTA.

RUELLIA, in botany, a genus of the didynamia angioſpermia claſs. The calix has five ſegments, and the corolla is ſubcampanulated; and the ſtamina are very near each other. There are eleven ſpecies, none of them natives of Britain.

RUFF, in ichthyology. See PERCA.

RUFF, in ichthyology. See TRINGA.

RUGEN,

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RUGEN, an iſland of the Baltic ſea, on the coaſt of Germany, being part of the duchy of Swediſh Pomerania, ſeparated from the continent by a narrow channel: this iſland is thirty miles long, and near as many broad.

RUINS, a term particularly uſed for magnificent buildings fallen into decay by length of time, and whereof there only remains a confuſed heap of materials.

RULE, in matters of literature, a maxim, canon, or precept, to be obſerved in any art or ſcience.

RULE OF THREE. See ARITHMETICK, p. 331.

RULE, or RULER, an inſtrument of wood or metal, with ſeveral lines delineated on it, of great uſe in practical menſuration. When a ruler has the lines of chords, tangents, ſines, *&c.* it is called a plane ſcale.

RUM, a ſpecies of brandy or vinous ſpirits, diſtilled from ſugar-canes.

Rum, according to Dr. Shaw, differs from ſimple ſugar-ſpirit, in that it contains more of the natural flavour or eſſential oil of the ſugar-cane; a great deal of raw juice and parts of the cane itſelf being often fermented in the liquor or ſolution of which the rum is prepared. The unctuous or oily flavour of rum is often ſuppoſed to proceed from the large quantity of fat uſed in boiling the ſugar; which fat, indeed, if coarſe, will uſually give a ſtinking flavour to the ſpirit, in our diſtillations of the ſugar liquor, or waſh, from our refining ſugar-houſes; but this is nothing of kin to the flavour of the rum, which is really the effect of the natural flavour of the cane.

The method of making rum is this: When a ſufficient ſtock of the materials is got together, they add water to them, and ferment them in the common method, though the fermentation is always carried on very ſlowly at firſt; becauſe at the beginning of the ſeaſon for making rum in the iſlands, they want yeaſt, or ſome other ferment to make it work; but by degrees, after this, they procure a ſufficient quantity of the ferment, which riſes up as a head to the liquor in the operation; and thus they are able afterwards to ferment and make their rum with a great deal of expedition, and in large quantities.

When the waſh is fully fermented, or to a due degree of acidity, the diſtillation is carried on in the common way, and the ſpirit is made up proof: though ſometimes it is reduced to a much greater ſtrength, nearly approaching to that of alcohol or ſpirit of wine, and it is then called double-diſtilled rum. It might be eaſy to rectify the ſpirit, and bring it to much greater purity than we uſually find it to be of: for it brings over in the diſtillation a very large quantity of the oil; and this is often ſo diſagreeable, that the rum muſt be ſuffered to lie by a long time to mellow before it can be uſed; whereas, if well rectified, it would grow mellow much ſooner, and would have a much leſs potent flavour.

The beſt ſtate to keep rum in, both for exportation and other uſes, is doubtleſs that of alcohol, or rectified ſpirit. In this manner it would be tranſported in one half the bulk it uſually is, and might be let down to the common proof-ſtrength with water when neceſſary: for the common uſe of making punch, it would likewiſe ſerve much better in the ſtate of alcohol; as the taſte would be cleaner: and the ſtrength might always be regulated to a much greater exactneſs than in the ordinary way.

The only uſe to which it would not ſo well ſerve in this ſtate, would be the common practice of adulteration among our diſtillers; for when they want to mix a large portion of cheaper ſpirit with the rum, their buſineſs is to have it of the proof-ſtrength, and as full of the flavouring oil as they can, that it may drown the flavour of the ſpirits they mix with it, and extend its own. If the buſineſs of rectifying rum was more nicely managed, it ſeems a very practicable ſcheme to throw out ſo much of the oil, as to have it in the fine light ſtate of a clear ſpirit, but lightly impregnated with it; in this caſe it would very nearly reſemble arrac, as is proved by the mixing a very ſmall quantity of it with a taſteleſs ſpirit, in which caſe the whole bears a very near reſemblance to arrac in flavour.

Rum is uſually very much adulterated in England; ſome are ſo bare-faced as to do it with malt-ſpirit; but when it is done with molaſſes-ſpirit, the taſtes of both are ſo nearly allied, that it is not eaſily diſcovered. The beſt method of judging of it is, by ſetting fire to a little of it; and when it has burnt away all the inflammable part, examining the phlegm both by the taſte and ſmell.

RUMELIA, in geography, the ſame with ancient Greece, now a part of Turky in Europe.

RUMEN, the paunch, or firſt ſtomach of ſuch animals as chew the cud, thence called ruminant animals.

The rumen is by far the largeſt of all the ſtomachs, and in it the whole maſs of crude aliments, both ſolid and liquid, lies and macerates; to be thence tranſmitted to the mouth to be again chewed, comminuted, and fitted for farther digeſtion in the other ventricles.

RUMEX, in botany, a genus of the hexandria trigynia claſs. The calix has three leaves, and the corolla three connivent petals; and there is but one triangular ſeed. The ſpecies are 27, of which ten are natives of Britain.

RUMFORD, a market-town of Eſſex, ten miles eaſt of London.

RUNGS, in a ſhip, the ſame with the floor or ground timbers, being the timbers which conſtitute her floor, and are bolted to the keel, whoſe ends are rung-heads.

RUNG-*heads*, in a ſhip, are made a little bending, to direct the ſweep or mold of the futtocks and navel timbers: for here the lines, which make the compaſs and bearing of a ſhip, do begin.

RUNIC, a term applied to the language and letters of the ancient Goths, Danes, and other northern nations.

RUNNER, in the ſea-language, a rope belonging to the garnet, and to the two bolt-tackles. It is reeved in a ſingle block, joined to the end of a pennant, and has at one end a hook to hitch into any thing, and at the other end a double block, into which is reeved the fall of the tackle, or the garnet, by which means it purchaſes more than the tackle would without it.

RUNNET, or RENNET, the acid juice found in the ſtomachs of calves that have fed on nothing but milk, and are killed before the digeſtion is perfect. It curdles milk.

RUPERT'S DROPS, a ſort of glaſs-drops with long and ſlender tails, which burſt to pieces on the breaking off thoſe tails in any part; ſaid to have been invented by prince Rupert, and therefore called after his name. This ſurpriſing phænomenon is ſuppoſed to riſe from hence, that while the glaſs is in fuſion, or in a melted ſtate, the particles of it are in a ſtate of repulſion; but being dropped into cold water, it ſo condenſes the particles in the external parts of their ſuperficies, that they are eaſily reduced

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duced within the power of each other's attraction, and by that means they form a ſort of hard caſe, which keeps confined the beforementioned particles in their repulſive ſtate; but when this outer-caſe is broke, by breaking off the tail of the drop, the ſaid confined particles have then a liberty to exert their force, which they do by burſting the body of the drop, and reducing it to a very peculiar form of powder.

RUPERT-FORT, a ſettlement belonging to the Hudſon's Bay company, ſituated at the bottom of the ſaid bay, in W. long. 80°, N. lat. 51°.

RUPICAPRA, in zoology. See CAPRA.

RUPPIA, in botany, a genus of the tetrandria tetragynia claſs. It has neither calix nor corolla; but four pedicled ſeeds. There is one ſpecies, *viz.* the marina, or ſea-graſs.

RUPTURE, in ſurgery. See SURGERY.

RURAL, or RUSTIC, in general, denotes ſomething that relates to the country.

RUSCUS, BUTCHER'S BROOM, in botany, a plant of the diœcia ſyngeneſia claſs. The calix of the male conſiſts of ſix leaves; it has no corolla; the nectarium is central, oval, and perforated at the top: The calix, corolla, and nectarium of the female are the ſame with thoſe of the male; it has one ſtylus; and the berry has three cells, and two ſeeds. There are five ſpecies, only one of them, *viz.* the aculeatus, knee-holly, or butcher's-broom, a native of Britain.

RUSH, in botany. See JUNCUS.

RUSSIA, or MUSCOVY, a large empire, comprehending a vaſt extent of country, in the moſt northerly parts of Europe and Aſia, from 24° to 130°, E. long. and between 45° and 72° N. lat.

Its capital cities are Moſcow and Peterſburg.

RUST *of a metal*, the flower or calx thereof, procured by corroding and diſſolving its ſuperficial parts by ſome menſtruum. Water is the great inſtrument or agent in producing ruſt: and hence oils, and other fatty bodies, ſecure metals from ruſt; water being no menſtruum to oil, *&c.* and therefore not able to make its way through it.

All metals are liable to ruſt, even gold itſelf, if expoſed to the fumes of ſea-ſalt.

RUSTIC, in architecture, implies a manner of building in imitation of nature, rather than according to the rules of art. See ARCHITECTURE.

RUSTIC WORK, is where the ſtones in the face, *&c.* of a building, inſtead of being ſmooth, are hatched, or picked with the point of a hammer.

RUSTRE, in heraldry, a bearing of a diamond-ſhape, pierced through in the middle with a round hole. See Plate CXLVII. fig. 12.

RUT, in hunting, the venery or copulation of deer.

RUTA, in botany, a genus of the decandria monogynia claſs. The calix has five ſegments; the petals are concave; the germen is ſurrounded by ten melliferous pores; and the capſule is lobbed. There are three ſpecies, none of them natives of Britain.

The dried herb is much uſed in medicine, by way of infuſion; being eſteemed an excellent alexipharmic and cephalic, and accordingly preſcribed in the ſmall-pox, meaſles, and hyſteric and nervous caſes; as alſo in peripneumonies and pleuriſies, to ſtrengthen the ſtomach, and to prevent the return of habitual colics.

Goat RUE, in botany. See GALEGA.

Meadow RUE See THALICTRUM.

Wall RUE. See ADIANTUM.

Book of RUTH, a canonical book of the Old Teſtament, being a kind of appendix to the book of Judges, and an introduction to thoſe of Samuel; and having its title from the perſon whoſe ſtory is here principally related. In this ſtory are obſervable the ancient rights of kindred and redemption, and the manner of buying the inheritance of the deceaſed, with other particulars of great note and antiquity.

RUTHYN, a market-town of Denbighſhire, eight miles ſouth-eaſt of Denbigh.

RUTICILLA, in ornithology. See MUSCUAPA.

RUTILUS, in ichthyology. See CYPRINUS.

RUTLAND, the leaſt county in England, bounded by Lincolnſhire on the north-eaſt, by Northamptonſhire on the ſouth-eaſt, and by Leiceſterſhire on the weſt and north-weſt.

RYE, in botany. See SECALE.

RYE, in geography, a borough and port town of Suſſex, ſituated on a bay of the Engliſh Channel, ſixty miles ſouth-eaſt of London. It ſends two members to parliament

RYNCHOPS, in ornithology, a genus belonging to the order of anſeres. The beak is ſtrait, the ſuperior mandible being much ſhorter than the inferior, which is truncated at the point. The ſpecies are two, *viz.* the nigra and ſulva, both natives of America.

RYPEN, a city and port-town of Jutland, in Denmark: E. long. 9° N lat. 55° 30'.

RYSWICK, a fine village in Holland, between the Hague and Delft, where the peace in 1697 was concluded.

RZCEZICA, a city of Lithuania, in Poland, ſituated on the river Nieper, E. long. 30°, N. lat. 53°.

S.

S A B

SABA, one of the Caribbee iſlands, ſubject to the Dutch: W. long. 63°, N. lat 18°.

SABÆANS, in church-hiſtory, a ſect of idolaters, much ancienter than the Jewiſh law.

S A B

In the early ages of the world, idolatry was divided between two ſects; the worſhippers of images, called Sabæans, or Sabians; and the worſhippers of fire, called magi. See MAGI.

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The Sabæans began with worſhipping the heavenly bodies, which they fancied were animated by inferior deities. In the conſecration of their images, they uſed many incantations to draw down into them from the ſtars thoſe intelligences for whom they erected them, whoſe power and influence they held afterwards dwelt in them. This religion, it is ſaid, firſt began among the Chaldæans, with their knowledge in aſtronomy: and from this it was, that Abraham ſeparated himſelf, when he came out of Chaldæa. From the Chaldæans it ſpread all over the eaſt; and from thence to the Grecians, who propagated it to all the nations of the known world. The remainder of this ſect ſtill ſubſiſts in the eaſt, and pretend to derive their name from Sabius a ſon of Seth; and among the books in which the doctrines of this ſect are contained, they have one which they call the book of Seth, and which they pretend was written by that patriarch.

SABBATH, or the day of reſt, a ſolemn feſtival of the Jews, on the ſeventh day of the week, or Saturday, beginning from ſun-ſet on Friday, to ſun-ſet on Saturday.

The obſervation of the Sabbath began with the world: for God having employed ſix days in its creation, appointed the ſeventh as a day of reſt to be obſerved by man, in commemoration of that great event. On this day the Jews were commanded to abſtain from all labour, and to give reſt to their cattle. They were not allowed to go out of the city farther than two thouſand cubits, or a mile; a cuſtom which was founded on the diſtance of the ark from the tents of the Iſraelites, in the wilderneſs, after their leaving Egypt; for being permitted to go, even on the ſabbath day, to the tabernacle to pray, they from thence inferred, that the taking a journey of no greater length, tho' on a different account, could not be a breach of the ſabbatical reſt.

As the ſeventh day was a day of reſt to the people, ſo was the ſeventh year to the land; it being unlawful in this year to plow or ſow, and whatever the earth produced belonged to the poor: this was called the ſabbatical year. The Jews, therefore, were obliged, during the ſix years, and more eſpecially the laſt, to lay up a ſufficient ſtore for the ſabbatical year.

The modern as well as the ancient, Jews, are very ſuperſtitious in the obſervance of the ſabbath; they carry neither arms, nor gold nor ſilver about them, and are permitted neither to touch theſe, nor a candle, nor any thing belonging to the fire; on which account they light up lamps on Friday, which burn till the end of the ſabbath.

SABBELLIANS, a ſect of Chriſtians of the IIId century, that embraced the opinions of Sabellius, a philoſopher of Egypt, who openly taught that there is but one perſon in the Godhead.

The Sabellians maintained, that the Word and the Holy Spirit are only virtues, emanations, or functions of the Deity; and held, that he who is in heaven is the Father of all things, deſcended into the virgin, became a child, and was born of her as a ſon; and that having accompliſhed the myſtery of our ſalvation, he diffuſed himſelf on the apoſtles in tongues of fire, and was then denominated the Holy Ghoſt. This they explained by reſembling God to the ſun, the illuminative virtue or quality of which was the Word, and its warming virtue the Holy Spirit. The Word, they taught, was darted, like a divine ray, to accompliſh the work of redemption; and that, being re aſcended to heaven, the influences of the Father were communicated after a like manner to the apoſtles.

SABINA, in botany. See JUNIPERUS.

SABINA, a province of Italy, in the pope's territories, bounded by Umbria on the north, by Naples on the eaſt, by the Campania of Rome on the ſouth, and by St Peter's Patrimony on the weſt.

SABLE, in zoology. See MUSTELA.

SABLE, in heraldry, denotes the colour black, in coats of arms belonging to gentlemen; but in thoſe of noblemen it is called diamond; and in thoſe of ſovereign princes, Saturn. See COLOUR.

It is expreſſed in engraving by perpendicular and horizontal hatches croſſing one another, as repreſented in Plate CXLVII. fig. 13.

SABLUSTAN, a province of Perſia, which comprehending Gaur and Candahor, is bounded by Choraſſan on the north, by India on the eaſt, and by Sigiſtian on the ſouth.

SABRE, a kind of ſword or ſcimiter, with a very broad and heavy blade, thick at the back, and a little falcated or crooked towards the point: it is the ordinary weapon worn by the Turks, who are ſaid to be very expert in the uſe of it.

SABURRÆ, GRITTS, in natural hiſtory, a genus of foſſils, found in minute maſſes, forming together a kind of powder, the ſeveral particles of which are of no determinate ſhape, nor have any tendency to the figure of cryſtal, but ſeem rudely broken fragments of larger maſſes; not to be diſſolved or diſunited by water, but retaining their figure in it, and not cohering by means of it into a maſs; conſiderably opake, and in many ſpecies fermenting with acids; often fouled with heterogene matters, and not unfrequently taken in the coarſer ſtony and mineral or metalline particles.

Gritts are of various colours, as, 1. The ſtony and ſparry gritts, of a bright or greyiſh white colour. 2. The red ſtony gritts. 3. The green ſtony gritts, compoſed of homogene ſparry particles. 4. The yellow gritt, of which there is only one ſpecies, 5. The black and blackiſh gritts, compoſed of ſtony or talcy particles.

SACCADE, in the manege, is a jerk more or leſs violent, given by the horſeman to the horſe, in pulling or twitching the reins of the bridle all on a ſudden, and with one pull, and that when a horſe lies heavy upon the hand, or obſtinately arms himſelf.

SACCAI, a city and port-town of Japan, ſituated on the bay of Mecao, three hundred miles ſouth-weſt of Jeddo: E. long. 135°, and N. lat. 36.

SACCHARUM, in botany, a genus of the triandria digynia claſs. It has no calix, but long down in place of it; and the corolla has two valves. There are two ſpecies, both natives of India. See SUGAR.

SACCHARUM SATURNI, *ſugar of lead*, is thus ordered to be made in the London Diſpenſatory; boil ceruſs with diſtilled vinegar, until the vinegar becomes ſufficiently ſweet; then filter the vinegar through paper, and after due evaporation ſet it to cryſtallize.

SACCULUS, in anatomy, a diminutive of ſaccus, ſignifies a little bag, and is applied to many parts of the body. See ANATOMY.

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SACER, in ornithology. See FALCO.

SACERDOTAL, ſomething belonging to prieſts. See PRIEST.

SACK *of wool*, a quantity of wool containing juſt twenty-two ſtone, and every ſtone fourteen pounds. In Scotland, a ſack is twenty-four ſtone, each ſtone containing ſixteen pounds.

SACK *of cotton wool*, a quantity from one hundred and a half to four hundred weight.

SACKS *of earth*, in fortification, are canvas bags filled with earth. They are uſed in making retrenchments in haſte, to place on parapets, or the head of the breeches, *&c.* to repair them, when beaten down.

SACKBUT, a muſical inſtrument of the wind kind, being a ſort of trumpet, though different from the common trumpet both in form and ſize: it is fit to play a baſs, and is contrived to be drawn out or ſhortened, according to the tone required, whether grave or acute. The Italians call it trombone, and the Latins tuba ductilis.

SACRAMENT ſignifies, in general, a ſign of a thing ſacred and holy; and is defined to be an outward and viſible ſign of a ſpiritual grace. Thus there are two objects in a ſacrament, the one the object of the ſenſes, and the other the object of faith. Proteſtants admit only of two ſacraments, baptiſm and the euchariſt or Lord's ſupper; but the Roman-catholics own ſeven, *viz.* baptiſm, confirmation, the euchariſt, penance, extreme unction, ordination, and marriage.

The Romaniſts, however, by way of eminence, call the euchariſt the holy ſacrament. Thus to expoſe the holy ſacrament, is to lay the conſecrated hoſt on the altar to be adored. The proceſſion of the holy ſacrament, is that in which this hoſt is carried about the church, or about a town.

SACRAMENTARY, an ancient Romiſh church-book, which contains all the prayers and ceremonies practiſed at the celebration of the ſacraments.

It was wrote by pope Gelaſius, and afterwards reviſed, corrected, and abridged by St Gregory.

SACRED, ſomething holy, or that is ſolemnly offered and conſecrated to God, with benedictions, unctions, *&c.*

SACRIFICE, a ſolemn act of religious worſhip, which conſiſted in dedicating or offering up ſomething animate or inanimate on an altar, by the hands of the prieſt, either as an expreſſion of their gratitude to the Deity for ſome ſignal mercy, or to acknowledge their dependance on him, or to conciliate his favour. The origin of ſacrifices is by ſome aſcribed to the Phœnicians: but Porphyry aſcribes it to the Egyptians, who firſt offered the firſt-fruits of their grounds to the gods, burning them upon an altar of turf: thus in the moſt ancient ſacrifices there were neither living creatures, nor any thing coſtly or magnificent, and no myrrh or frankincenſe. At length they began to burn perfumes: and afterwards men leaving their ancient diet of herbs and roots, and beginning to uſe living creatures for food, they began alſo to change their ſacrifices. The ſcriptures, however, furniſh us with a different account: for Noah, it is ſaid, ſacrificed animals at his coming out of the ark; and even Abel himſelf ſacrificed the beſt and fatteſt of his flock; but Grotius thinks it more probable that he contented himſelf with making a mere oblation of his lambs, *&c.* without flaying them.

The Jews had two ſorts of ſacrifices, taking the word in its largeſt ſignification: The firſt were offerings of tythes, firſt-fruits, cakes, wine, oil, honey, and the like; and the laſt, offerings of ſlaughtered animals. When an Iſraelite offered a loaf or a cake, the prieſt broke it in two parts; and ſetting aſide that half which he reſerved for himſelf, broke the other into crumbs, poured oil, wine, incenſe, and ſalt upon it, and ſpread the whole upon the fire of the altar. If theſe offerings were accompanied with the ſacrifice of an animal, they were thrown upon the victim to be conſumed along with it. If the offerings were of the ears of new corn, they were parched at the fire, rubbed in the hand, and then offered to the prieſt in a veſſel, over which he poured oil, incenſe, wine and ſalt, and then burnt it upon the altar, having firſt taken as much of it as of right belonged to himſelf.

The principal ſacrifices among the Hebrews conſiſted of bullocks, ſheep, and goats; but doves and turtles were accepted from thoſe who were not able to bring the other; theſe beaſts were to be perfect, and without blemiſh. The rites of ſacrificing were various, all of which are very minutely deſcribed in the books of Moſes.

The manner of ſacrificing among the Greeks and Romans was as follows. In the choice of the victim, they took care that it was without blemiſh or imperfection; its tail was not to be too ſmall at the end; the tongue not black, nor the ears cleft; and that the bull was one that had never been yoked. The victim being pitched upon, they gilt his forehead and horns, eſpecially if a bull, heifer, or cow. The head they alſo adorned with a garland of flowers, a woollen infula or holy fillet, whence hung two rows of chaplets with twiſted ribbands; and on the middle of the body a kind of ſtole, pretty large, hung down on each ſide; the leſſer victims were only adorned with garlands and bundles of flowers, together with white tufts or wreaths.

The victims thus prepared were brought before the altar; the leſſer being driven to the place, and the greater led by an halter; when if they made any ſtruggle, or refuſed to go, the reſiſtance was taken for an ill omen, and the ſacrifice frequently was ſet aſide. The victim thus brought was carefully examined, to ſee that there was no defect in it: then the prieſt, clad in his ſacerdotal habit, and accompanied with the ſacrificers and other attendants, and being waſhed and purified according to the ceremonies preſcribed, turned to the right-hand and went round the altar, ſprinkling it with meal and holy-water, and alſo beſprinkling thoſe who were preſent. Then the crier proclaimed with a loud voice, Who is here? To which the people replied, Many and good. The prieſt then having exhorted the people to join with him by ſaying, Let us pray, confeſſed his own unworthineſs, acknowledging that he had been guilty of divers ſins; for which he begged pardon of the gods, hoping that they would be pleaſed to grant his requeſts, accept the oblations offered them, and ſend them all health and happineſs; and to this general form added petitions for ſuch particular favours as were then deſired. Prayers being ended, the prieſt took a cup of wine; and having taſted it himſelf, cauſed his aſſiſtants to do the like; and then poured forth the remainder between the horns of the victim. Then the prieſt or the crier, or ſometimes the moſt honourable perſon in the company, killed the beaſt, by

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by knocking it down, or cutting its throat. If the ſacrifice was in honour of the celeſtial gods, the throat was turned up towards heaven: but if they ſacrificed to the heroes or infernal gods, the victim was killed with its throat towards the ground. If by accident the beaſt eſcaped the ſtroke, leaped up after it, or expired with pain and difficulty, it was thought to be unacceptable to the gods. The beaſt being killed, the prieſt inſpected its entrails, and made predictions from them. They then poured wine, together with frankincenſe, into the fire, to increaſe the flame, and then laid the ſacrifice on the altar; which in the primitive times was burnt whole to the gods, and thence called an holocauſt; but in after-times, only part of the victim was conſumed in the fire, and the remainder reſerved for the ſacrificers; the thighs, and ſometimes the entrails, being burnt to their honour, the company feaſted upon the reſt. While the ſacrifice was burning, the prieſt, and the perſon who gave the ſacrifice, jointly prayed, laying their hands upon the altar. Sometimes they played upon muſical inſtruments in the time of the ſacrifice, and on ſome occaſions they danced round the altar, ſinging ſacred hymns in honour of the gods.

SACRIFICE, is alſo a name of an iſland in the gulph of Mexico, forty-five miles eaſt of La Vera Cruz; it is ſubject to the Spaniards.

SACRILEGE, the crime of profaning ſacred things, or thoſe devoted to the ſervice of God.

SACRISTAN, a church-officer, otherwiſe called ſexton. See SEXTON

SACRISTY, in church hiſtory, an apartment in a church, where the ſacred utenſils were kept; being the ſame with our veſtry. See VESTRY.

SACRO LUMBARIS, in anatomy. See ANATOMY, p. 203.

SACRUM OS. See ANATOMY, p. 170.

SADERASAPATAN, a port-town of the coaſt of Cormandel forty miles ſouth of Fort St George. Here the Dutch have a factory.

SADDLE, is a ſeat upon a horſe's back, contrived for the conveniency of the rider.

A hunting ſaddle is compoſed of two bows, two bands, fore-bolſters, pannels, and ſaddle-ſtraps; and the great ſaddle has, beſides theſe parts, corks, hind-bolſters, and a trouſſequin.

The pommel is common to both.

SADDUCEES, in Jewiſh antiquity, a famous ſect among the ancient Jews, ſo called from their founder Sadoc. Antigonus of Socho, preſident of the ſanhedrim at Jeruſalem, and teacher of the law in the divinity ſchool of that city. Having often, in his lectures, aſſerted to his ſcholars, that they ought not to ſerve God in a ſervile manner, with reſpect to reward, but only out of filial love and fear; two of his ſcholars, Sadoc and Baithus, inferred from thence, that there were no rewards or puniſhments after this life; and, therefore, ſeparating from the ſchool of their maſter, they taught that there was no reſurrection, nor future ſtate. Many embracing this opinion, gave riſe to the ſect of the Sadducees, who were a kind of Epicureans, but differing from them in this, that though they denied a future ſtate, yet they allowed the world was created by the power of God, and governed by his providence; whereas the followers of Epicurus denied both.

The Sadducees denied all manner of predeſtination whatever; and not only rejected all unwritten traditions, but alſo all the books of the Old Teſtament, excepting the Pentateuch.

SAFE GUARD, a protection formerly granted to a ſtranger, who feared violence from ſome of the king's ſubjects, for ſeeking his right by courſe of law.

SAFFRON, in botany, *&c.* See CROCUS.

Meadow SAFFRON, in botany. See COLCHICUM.

SAGAPENUM, in pharmacy, *&c.* a gum-reſin, brought to us in two forms: the finer and purer is in looſe granules, or ſingle drops: the coarſer kind is in maſſes compoſed of theſe drops of various ſizes, cemented together by a matter of the ſame kind. In either caſe, it is of a firm and compact ſubſtance, conſiderably heavy, and of a reddiſh colour on the outſide, browniſh within, and ſpotted in many places with ſmall yellowiſh or whitiſh ſpecks. Its ſmell is ſtrong and diſagreeable: its taſte acrid and unpleaſant.

It is brought to us from Perſia and the Eaſt-Indies.

Sagapenum is a very great attenuant, aperient, and diſcutient; it is good in all diſorders of the breaſt that owe their origin to a tough phlegm.

SAGE, in botany See SALVIA.

SAGENE, a Ruſſian long meaſure, five hundred of which make a werſt: the ſagene is equal to ſeven Engliſh feet.

SAGINA, in botany, a genus of the tetrandria tetragynia claſs. The calix conſiſts of four leaves, and the corolla of four petals; the capſule has four cells, and four valves, containing many ſeeds. There are three ſpecies, two of them natives of Britain, *viz.* the procumbens, or pearl-wort; and the erecta, or the leaſt ſtitch wort.

SAGITTA, in aſtronomy. See ASTRONOMY, p. 487.

SAGITTAL SUTURE, in anatomy. See ANATOMY, p. 152.

SAGITTARIA, in botany, a genus of the monœcia polyandria claſs. The calix of the male conſiſts of three ſegments, and the corolla of three petals; and the ſtamina are about 24. The calix and corolla of the female are the ſame with thoſe of the male; it has no piſtillum; and the ſeeds are many, and naked. The ſpecies are four, only one of them, *viz.* the ſagittifolia, or arrow head, a native of Britain.

SAGITTARIUS, in aſtronomy. See ASTRONOMY, p. 487

SAGO, a ſimple brought from the Eaſt Indies, of conſiderable uſe in diet as a reſtorative.

Sago is a ſort of bread produced in the following manner, from a tree called landan, growing in the Moluccos. When a tree is felled, they cleave it in two in the middle, and dig out the pith, which is eatable when it comes freſh out of the tree. They pound it in a mortar, till it is reduced into a kind of powder ſomewhat like meal. Then they put in a ſearce made of the bark of the ſame tree, placing it over a ciſtern made of its leaves, and pour water on it, which ſeparates the pure part of the powder from the woody fibres wherewith the pith abounds. The flour thus filtrated they call ſagu, which they make into paſte, and bake it in earthen furnaces.

SAGREE, in ichthyology. See SQUALUS.

SAICK, or SAIQUE, a Turkiſh veſſel, very common in the Levant for carrying of merchandize.

SAIL, in navigation, an aſſemblage of ſeveral breadths of canvas,

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canvas, ſewed together by the liſts, and edged round with a cord, faſtened to the yards of a ſhip, to make it drive before the wind. See SHIP.

SAILING, properly denotes the art of navigating and working a ſhip, or of cauſing her to obſerve ſuch motions and directions as are aſſigned by the navigator; in which ſenſe, ſailing differs from navigation, and muſt be learned by practice on ſhipboard. See NAVIGATION.

SAINT, in the Romiſh church, a holy perſon deceaſed, and ſince his deceaſe canonized by the pope, after ſeveral informations and ceremonies. See CANONIZATION.

SAINT-FOIN, in botany. See HEDYSARUM, and AGRICULTURE, p. 65.

SAL, one of the iſlands of cape Verd, ſituated in the Atlantic ocean: W. long. 23°, lat. 17°.

SALAMANCA, a city of Spain in the province of Leon, ſituated on the river Tormes: W. long. 6° 10′, N. lat. 41°.

SALAMANDER, in zoology. See LACERTA.

SALAMIS, an iſland in the gulph of Engia, in European Turky, ſituated in E. long. 34°, N. lat. 37° 32′, being about fifty miles in circumference.

SALEM, a port-town of New England, a little north of Boſton.

SALEP, in the materia medica, the root of a ſpecies of orchis. See ORCHIS.

Salep ſhould be choſen clean, firm and hard: it is very little liable either to decay or ſophiſtication. The ſalep differs very little from the common orchis in virtue. Its appearance is owing to the manner of preparing it, and conſequently this may be done from the roots of orchis of our own growth. To prepare theſe in imitation of ſalep, Mr. Geoffroy choſe the largeſt, faireſt, and plumpeſt roots he could find: theſe he nicely ſkinned; then throwing them into cold water, he ſuffered them to macerate there for ſome time: after this he lightly boiled them, and then taking them out of the water and draining them, he had them ſtrung upon threads to be dried in a warm dry air: when the roots were thoroughly dried, they were very tranſparent, and reſembled pieces of tragacanth, and continued dry and hard. The roots thus prepared may be reduced to powder, which will diſſolve away in boiling water; and a ſcruple of it will make a baſon full of jelly, in the manner of the Turkiſh ſalep. This jelly is an admirable medicine in all caſes in which ſalep is preſcribed; and the powder may be given with great ſucceſs in aſſes-milk for diſeaſes of the breaſt.

SALERNO, a city and port-town of Italy, in the kingdom of Naples and the hither principate, ſituated on a bay of the Tuſcan ſea: E. long. 15° 20′, N. lat. 40° 40′.

SALET, in war, a light covering or armour for the head, anciently worn by the light horſe, only differing from the caſk in that it had no creſt, and was little more than a bare cap.

SALIANT, in fortification, denotes projecting. There are two kinds of angles, the one ſaliant, which are thoſe that preſent their point outwards; the other re-entering, which have their points inwards. See FORTIFICATION.

SALIANT, SALLENT, or SAILLANT, in heraldry, is applied to a lion, or other beaſt, when its fore-legs are raiſed in a leaping poſture. See Plate CXLVII. fig. 14.

SALIC, or SALIQUE LAW, an ancient and fundamental law of the kingdom of France, uſually ſuppoſed to have been made by Pharamond, or at leaſt by Clovis, in virtue whereof males are only to inherit.

SALICORNIA, in botany, a genus of the monandria monogynia claſs. The calix is ventricoſe and entire; it has no corolla, and but one ſeed. The ſpecies are four, only one of them, *viz.* the europæa, or marſh ſampire, a native of Britain.

SALII, in Roman antiquity, prieſts of Mars, whereof there were twelve, inſtituted by Numa, wearing painted parti-coloured garments and high bonnets, with a ſteel-cuiraſſe on the breaſt. They were called ſalii from *ſaltare*, to dance; becauſe, after aſſiſting at ſacrifices, they went dancing about the ſtreets, with bucklers in the left hand, and a rod in the right, ſtriking muſically on one another's bucklers with their rods, and ſinging hymns in honour of the gods.

SALINA, anciently Salamis, a port-town of the iſland of Cyprus, ſituated on the ſouth ſide of the iſland, in E. long 34° 30′, and N. lat. 34° 30′.

SALINE, a name given to a preparation of ſea-ſalt, procured from the froth of the ſea, hardened by the ſun in hot countries. It is called by ſome authors pilatro de Levante, and is uſed in glaſs-making; and in the making the fine purple colour from cochineal, by boiling it in a ſmall quantity, with the bran and fœnugreek, of which the magiſtery is made for that purpoſe.

SALISBURY, the capital city of Wiltſhire, ſituated eighty miles weſt of London, and thirty-five miles ſouth-eaſt of Briſtol. It ſends two members to parliament.

SALIVA, SPITTLE, a thin pellucid humour, ſeparated from the arterial blood, by the glands about the mouth and fauces, and conveyed, by proper ſalival ducts, into the mouth, for ſeveral uſes. See ANATOMY, p. 307.

SALIVAL, an epithet applied to the glands and ducts which ſupply and ſecrete the ſaliva. See ANATOMY, p. 307.

SALIVATION, in medicine, a promoting of the flux of ſaliva, by means of medicines, moſtly by mercury. The chief uſe of ſalivation is in diſeaſes belonging to the glands and the membrana adipoſa, and principally in the cure of the venereal diſeaſe, though it is ſometimes alſo uſed in epidemic diſeaſes, cutaneous diſeaſes, *&c.* whoſe criſes tend that way. See MEDICINE.

SALIX, in botany, a genus of the dioecia diandria claſs. The amentum of both male and female conſiſts of ſcales; none of them have any corolla; the ſtylus is bifid; the capſule has but one cell, and two valves; and the ſeeds are pappous. There are 31 ſpecies, 18 of them natives of Britain.

SALEE, a port-town of the empire of Morrocco, in the kingdom of Fez, ſituated on the coaſt of the Atlantic ocean: W. long. 7°, and N. lat. 34°.

SALLY, in the military art, the iſſuing out of the beſieged from their town or fort, and falling upon the beſiegers in their works, in order to cut them off, nail their cannon, hinder the progreſs of their approaches, deſtroy their works, *&c.*

SALMO, in ichthyology, a genus belonging to the order of abdominales: The head is ſmooth, and furniſhed with teeth, and a tongue; the rays of the gills are from four to ten; the back-fin is fat behind; and the belly-fins have many rays. There are 29 ſpecies.

SALMON-FISHING. See FISHERY.

SALOON,

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SALOON, in architecture, a very lofty ſpacious hall, vaulted at top, and ſometimes comprehending two ſtories or ranges of windows.

SALONICHI, a city and port-town of Macedon, in Turky, anciently called Theſſalonica, two hundred and ſixty miles weſt of Conſtantinople: E. long. 24°, N. lat. 41°.

SALPA, in ichthyology. See SPARUS.

SALSETTE, an iſland on the weſtern coaſt of the hither India, ſeparated from that of Bombay by a narrow channel: it belongs to the Portugueſe, and is twenty miles long, and ſeventeen broad.

SALSOLA, in botany. See KALI.

SALT, the name of a ſeries or ſubdiviſion of foſſils, naturally and eſſentially ſimple, not inflammable, and ſoluble in water. See CHEMISTRY, p. 122, &c.

SALTIER, in heraldry, an ordinary in form of a St. Andrew's-croſs: which may be ſaid to be compoſed of a bend dexter and ſiniſter, croſſing each other in the centre of the eſcutcheon. See Plate CXLVII fig. 15.

SALT-PETRE. See NITRE.

SALTSBURG, the capital of an archbiſhopric of the ſame name, in Bavaria, ſituated on the river Saltza, ſeventy miles eaſt of Munich: E. long. 13°, N. lat. 47° 45'.

SALVADORA, in botany, a genus of the tetrandria monogynia claſs. The calix has four ſegments; it has no corolla; the berry contains but one ſeed, furniſhed with an aun There is one ſpecies, a native of India.

SALVAGE MONEY, a reward allowed by the civil and ſtatute law, for the ſaving of ſhips or goods from the danger of the ſeas, pirates, or enemies.

Where any ſhip is in danger of being ſtranded, or driven on ſhore, juſtices of the peace are to command the conſtables to aſſemble as many perſons as are neceſſary to preſerve it; and on its being preſerved by their means, the perſons aſſiſting therein ſhall in thirty days after be paid a reaſonable reward for their ſalvage, otherwiſe the ſhip or goods ſhall remain in the cuſtody of the officers of the cuſtoms as a ſecurity for the ſame.

SALVIA, in botany, a genus of the diandria monogynia claſs. The corolla is unequal; and the filaments fixed tranſverſely to a pedicle. There are 32 ſpecies, two of them natives of Britain, *viz.* the pratenſis, or meadow-clary; and the verbera, or wild-clary.

SALUTATION, the act of ſaluting, greeting, or paying reſpect and reverence to any one.

There is a great variety in the forms of ſalutation. The orientals ſalute by uncovering their feet, laying their hands on their breaſts, &c. In Britain, we ſalute by uncovering the head, bending the body, &c. The pope makes no reverence to any mortal, except the emperor, to whom he ſtoops a very little, when he permits him to kiſs his lips.

SALUZZO, a city of Italy, the capital of a marquiſate of the ſame name in Piedmont, ſeventeen miles ſouth of Turin.

SAMARCAND, a city of Uſbec Tartary, formerly its capital: E. long. 66°, N. lat 40°.

SAMARIA, an ancient city of Paleſtine, in Aſiatic Turky, forty-five miles north of Jeruſalem.

SAMARITANS, an ancient ſect among the Jews, ſtill ſubſiſting in ſome parts of the Levant, under the ſame name

Its origin was in the time of Rehoboam, under whoſe reign the people of Iſrael were divided into two diſtinct kingdoms, that of Judah and that of Iſrael; when the capital of the latter being Samaria, the Iſraelites obtained the name of Samaritans.

They were anciently guilty of idolatry, and the rabbins pretend, that they worſhipped the figure of a dove on mount Gerizim; but the preſent Samaritans, who are but few in number, are far from being idolaters. They celebrate the paſſover every year, on the fourteenth day of the firſt month, on mount Gerizim, and begin that feaſt with the ſacrifice appointed for that purpoſe in Exodus: they keep the ſabbath with all the rigour with which it is injoined in the book of Exodus, none among them ſtirring out of doors but to the ſynagogue: they ſacrifice nowhere but on mount Gerizim: they obſerve the feaſts of expiation, tabernacles, harveſt, &c. and never defer circumciſion beyond the eighth day; they never marry their nieces, as the Jews do; have but one wife; and in fine, do nothing but what is commanded in the law.

SAMBALLAS, or SAMBLAS ISLANDS, ſeveral iſlands ſituated in the American ocean, near the coaſt of Darien, none of which are inhabited: E. long. 81°, N lat. 10°.

SAMBUCUS, in botany, a genus of the pentandria trigynia claſs. The calix and corolla conſiſt of five ſegments; and the berry contains three ſeeds. There are four ſpecies, two of them natives of Britain, *viz.* the nigra, or common elder; and the ebulus, or dwarf elder.

The inner green bark of this ſhrub is gently cathartic.

SAMIAN EARTH, in the materia medica, the name of two ſpecies of marle uſed in medicine, *viz.* 1. The white kind, called by the ancients collyrium ſamium; being aſtringent, and therefore good in diarrhœas dyſenteries, and hæmorrhages; they alſo uſed it externally in inflammations of all kinds. 2. The browniſh white kind, called alſo ſamias, by Dioſcorides: this alſo ſtands recommended as an aſtringent.

SAMOGITIA, a maritime province of Poland, bounded by Courland on the north, and by the Baltic on the weſt.

SAMOIDA, the moſt northerly province of Ruſſia in Europe, ſituated on the frozen ocean, and the river Oby.

SAMOLUS, in botany, a genus of the pentandria monogynia claſs. The corolla is rotated; the ſtamina are fortified by ſcales; and the capſule has one cell. There is but one ſpecies, *viz.* the valerandi, or round-leaved water pimpernel, a native of Britain.

SAMOS, a fertile iſland of the Archipelago, thirty miles ſouth of Smyrna: E long. 27° 30', N. lat. 37° 30'.

SAMOTHRACIA, a ſmall iſland in the Egean ſea, near the coaſt of Thrace.

SAMPSEANS, in church-hiſtory, an ancient ſect, who were properly neither Jews, Chriſtians, nor Gentiles, though they took their name from the Hebrew word *ſhemes*, ſun; as though they worſhipped that planet.

They acknowledged only one God; waſhed themſelves often: and in almoſt every thing attached themſelves to the religion of the Jews.

Books of SAMUEL, two canonical books of th Old Teſtament, ſo called as being uſually aſcribed to the prophet Samuel.

The books of Samuel, and the books of Kings, are a continued hiſtory of the reigns of the Kings of Iſrael and Judah; for which reaſon the books of Samuel are likewiſe

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wiſe ſtyled the firſt and ſecond books of Kings. Since the firſt twenty-four chapters contain all that relates to the hiſtory of Samuel, and the latter part of the firſt book, and all the ſecond, include the relation of events that happened after the death of that prophet, it has been ſuppoſed that Samuel was author only of the firſt twenty-four chapters, and that the prophets Gad and Nathan finiſhed the work. The firſt book of Samuel comprehends the tranſactions under the government of Eli, and Samuel; and under Saul, the firſt king; and alſo the acts of David, whilſt he lived under Saul; and is ſuppoſed to include the ſpace of a hundred and one years. The ſecond book contains the hiſtory of about forty years, and is wholly ſpent in relating the tranſactions of king David's reign.

SAMYDA, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of five coloured leaves; it has no corolla; and the berry has three valves, and one cell. There are five ſpecies, none of them natives of Britain.

SANCTIFICATION, the act of ſanctifying, or rendering a thing holy.

The reformed divines define ſanctification to be an act of God's grace, by which a perſon's deſires and affections are alienated from the world, and by which he is made to die to ſin, and to live to righteouſneſs; or, in other words, to feel an abhorrence of all vice, and a love of virtue and religion.

SANCTION, the authority given to a judicial act, by which it becomes legal and authentic.

SANCTUARY, among the Jews, alſo called Sanctum ſanctorum, or Holy of holies, was the holieſt and moſt retired part of the temple of Jeruſalem, in which the ark of the covenant was preſerved, and into which none but the high prieſt was allowed to enter, and that only once a year, to intercede for the people. Some diſtinguiſh the ſanctuary from the ſanctum ſanctorum, and maintain that the whole temple was called the ſanctuary.

To try and examine any thing by the weight of the ſanctuary, is to examine it by a juſt and equal ſcale: becauſe, among the Jews, it was the cuſtom of the prieſts to keep ſtone weights, to ſerve as ſtandards for regulating all weights by, though theſe were not at all different from the royal, or profane weights.

Sanctuary, in the Romiſh church, is alſo uſed for that part of the church in which the altar is placed, encompaſſed with a rail or baluſtrade.

SANCTUARY, in our ancient cuſtoms, is the ſame with aſylum. See ASYLUM.

SAND, in natural hiſtory, a genus of foſſils, the characters of which are, that they are found in minute concretions; forming together a kind of powder, the genuine particles of which are all of a tendency to one determinate ſhape, and appear regular, though more or leſs compleat concretions; not to be diſſolved or diſunited by water, or formed into a coherent maſs by means of it, but retaining their figure in it; tranſparent, vitrifiable by extreme heat, and not diſſoluble in, nor effervеſcing with, acids. Sands are ſubject to be variouſly blended both with homogene and heterogene ſubſtances, as that of talcs, &c. and hence, as well as from their various colours, are ſubdivided into a number of ſpecies.

SAND-BAGS, in the art of war, are bags filled with earth or ſand, holding each about a cubic foot: their uſe is to raiſe parapets in haſte, or to repair what is beaten down.

SANDECK, a town of little Poland, thirty-five miles ſouth-eaſt of Cracow.

SAND-EEL, *ammodytes*, in ichthyology. See AMMODYTES.

SANDAL, in antiquity, a rich kind of ſlipper worn on the feet by the Greek and Roman ladies, made of gold, ſilk, or other precious ſtuff, conſiſting of a ſole, with an hollow at one extreme to embrace the ancle, but leaving the upper part of the foot bare.

Sandal, is alſo uſed for a ſhoe or ſlipper worn by the pope, and other Romiſh prelates, when they officiate. It is alſo the name of a ſort of ſlipper worn by ſeveral congregations of reformed monks. This laſt conſiſts of no more than a mere leathern ſole, faſtened with latches or buckles, all the reſt of the foot being left bare. The capuchins wear ſandals; the recollects, clogs: the former are of leather, and the latter of wood.

SANDARACH, in natural hiſtory, a very beautiful native foſſil, though too often confounded with the common factitious red arſenic, and with the red matter formed by melting the common yellow orpiment.

It is a pure ſubſtance, of a very even and regular ſtructure, is throughout of that colour which our dyers term an orange-ſcarlet, and is conſiderably tranſparent even in the thickeſt pieces. But though, with reſpect to colour, it has the advantage of cinnabar while in the maſs, it is vaſtly inferior to it when both are reduced to powders. It is moderately hard, and remarkably heavy, and, when expoſed to a moderate heat, melts and flows like oil: if ſet on fire, it burns very briſkly.

It is found in Saxony and Bohemia, in the copper and ſilver mines; and is ſold to the painters, who find it a very fine and valuable red: but its virtues or qualities in medicine, are no more aſcertained at this time, than thoſe of the yellow orpiment.

Gum-SANDARACH, is a dry and hard reſin, uſually met with in looſe granules, of the bigneſs of a pea, a horſe-bean, or larger; of a pale whitiſh yellow, tranſparent, and of a reſinous ſmell, brittle, very inflammable, of an acrid and aromatic taſte, and diffuſing a very pleaſant ſmell when burning. It is produced from a ſpecies of the juniper.

It flows only from theſe trees in hot countries; but the natives promote its diſcharge by making inciſions in the bark.

Sandarach is good in diarrhœas, and in hæmorrhages.

The varniſh-makers make a kind of varniſh of it by diſſolving it in oil of turpentine or linſeed, or in ſpirit of wine.

SANDIVER, a whitiſh ſalt, continually caſt up from the metal, as it is called, whereof glaſs is made; and, ſwimming on its ſurface, is ſkimmed of.

Sandiver is alſo plentifully thrown out in the eruptions of volcanos; ſome is of a fine white, and others tinged bluiſh or yellowiſh.

Sandiver is detergent, and good for foulneſſes of the ſkin. It is alſo uſed by gilders of iron.

SANDIX, a kind of minium, or red-lead, made of ceruſe, but much inferior to the true minium.

SANDWICH, one of the cinque-ports, in Kent, ten miles eaſt of Canterbury: it ſends two members to parliament, and gives the title of Earl to the noble family of Montague.

SANGUI-

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SANGUIFICATION, in the animal œconomy, the converſion of chyle into true blood. See CHYLE.

SANGUINARIA, BLOOD-WORT, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of eight petals, and the calix of two leaves; the pod is oval, with one cell. There is but one ſpecies, a native of America.

SANGUINE, in general, ſomething abounding with, or reſembling blood. See BLOOD.

SANGUIS. See BLOOD.

SANGUISORBA, in botany, a genus of the tetrandria monogynia claſs. The calix has two leaves; and the germen is ſituate between the calix and corolla. There are three ſpecies, only one of them, *viz.* the officinalis, or burnet, a native of Britain, the leaves of which are mildly aſtringent.

SANHEDRIM, among the Jews, the great council of the nation, conſiſting of ſeventy ſenators, taken partly from among the prieſts and levites, and partly out of the inferior judges, who formed what was called the leſſer ſanhedrim. The room they met in was a rotunda, half of which was built without the temple, and half within. The naſi, or preſident of the ſanhedrim, ſat upon a throne, with his deputy on his right hand, his ſub-deputy on his left, and the other ſenators ranged in order on each ſide.

The authority of this council was very extenſive: for they decided ſuch cauſes as were brought before them by way of appeal from the inferior courts; and the king, the high-prieſts, and prophets, were under the juriſdiction of this tribunal. They had the right of judging in capital caſes, and ſentence of death might not be pronounced in any other place; for which reaſon the Jews were forced to quit this hall, when the power of life and death was taken out of their hands, forty years before the deſtruction of the temple, and three years before the death of Chriſt.

There were ſeveral inferior ſanhedrims in Paleſtine, each of which conſiſted of twenty-three perſons; all theſe depended on the great ſanhedrim of Jeruſalem.

SANICULA, in botany, a genus of the pentandria digynia claſs. The umbellæ are thick; the fruit is rough; and the flowers of the diſk are abortive. The ſpecies are three, only one of them, *viz.* the europæa, or ſanicle, is a native of Britain. The leaves are ſuppoſed to be vulnerary.

SANIDIUM, in natural hiſtory, the name of a genus of foſſils, of the claſs of the ſelenitæ, but neither of the rhomboidal nor columnar kinds, nor any other way diſtinguiſhable by its external figure, being made up of ſeveral plain flat plates.

SANIES, in medicine, a ſerous putrid matter, iſſuing from wounds; it differs from pus, which is thicker and whiter.

SANQUHAR, a borough-town of Scotland, in the county of Nithſdale, twenty-one miles north of Dumfries.

SANTA CLARA, an iſland in the Pacific Ocean, ſituated in the bay of Guayquil: W. long. 80°, S. lat, 3° 15'.

SANTA CRUZ, a port town on the north ſide of the iſland of Cuba, in North America: W. long. 85° 30', N. lat. 22° 30'.

SANTA FE, the capital of New Mexico: W. long. 109°, N. lat. 36°.

SANTA FE DE BAGOTA, the capital of Terra Firma, in South America: W. long. 74°, N. lat. 4° 30'.

SANTA MARIA, a town of Terra Firma, in the province of Darien, ſituated on a river of the ſame name, a little eaſt of the bay of Panama: W. long. 80°, N. lat 7° 40'.

SANTALUM, in botany, a genus of the octandria monogynia claſs. The corolla conſiſts of one petal; the ſtamina lie upon the tube; the ſtigma is ſimple; and the fruit is a berry. There is but one ſpecies, a native of India. The wood is reckoned to be attenuant and cordial.

SANTILLANA, a city and port-town of Spain, the capital of the eaſtern Aſturia, ſituated on the bay of Biſcay: W. long. 5°, and N. lat. 43° 35'

SANTOLINA, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is paleaceous; the pappus is very ſhort; and the calix is hemiſpherical and imbricated. The ſpecies are four, none of them natives of Britain.

SANTORINI, an iſland of the Archipelago, thirty-five miles in circumference: E. long. 25° 35', N. lat. 36° 10'.

SAONE, a river of France, which riſes in Lorrain, and falls into the Rhone at Lyons.

SAP, a juice furniſhed by the earth, and changed into the plant. See AGRICULTURE, p. 45.

SAPHENA, in anatomy. See ANATOMY, p. 243.

SAPIENZA, an iſland and cape in the mediterranean ſea, on the ſouth-weſt point of the Morea, E. long. 21° 15', N. lat. 36° 45'.

SAPPHIC, in poetry, a kind of verſe much uſed by the Greeks and Latins, denominated from the inventreſs Sappho. The Sapphic verſe conſiſts of five feet, whereof the firſt, fourth, and fifth are trochees, the ſecond a ſpondee, and the third a dactyl.

SAPINDUS, in botany, a genus of the octandria digynia claſs. The calix conſiſts of four leaves; and the corolla of four petals; and there are three round, connate, ventricoſe capſules. The ſpecies are three, none of them natives of Britain.

SAPO. See SOAP.

SAPONARIA, in botany, a genus of the decandria digynia claſs. The calix conſiſts of one leaf, and the corolla of five clawed petals; and the capſule is oblong, with one cell. There are ſix ſpecies, only one of them, *viz.* the officinalis, or ſoap-wort, a native of Britain. The root of this ſpecies is ſuppoſed to be aperient, corroborant, and ſudorific.

SAPPHIRE, a pellucid gem, which, in its fineſt ſtate, is extremely beautiful and valuable, and ſecond only to the diamond in luſtre, hardneſs, and price. Its proper colour is a pure blue; in the fineſt ſpecimens it is of the deepeſt azure, and in others varies into paleneſs in ſhades of all degrees, between that and a pure cryſtal brightneſs and water, without the leaſt tinge of colour, but with a luſtre much ſuperior to the cryſtal. They are diſtinguiſhed into four ſorts, *viz.* the blue ſapphire, the white ſapphire, the water ſapphire, and the milk ſapphire.

The gem known to us by this name is extremely different from the ſapphire of the ancients, which was only a ſemi-opake ſtone, of a deep blue, veined with white, and ſpotted with ſmall gold-coloured ſpangles, in the form of ſtars, and was only a more beautiful kind of the lapis lazuli: but our ſapphire they have deſcribed under the name of beryllus aeroides, or the ſky-blue beryl.

The fineſt ſapphires in the world are brought from the kingdom

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kingdom of Pegu in the Eaſt Indies, where ſome are found perfectly colourleſs, and others of all the ſhades of blue; theſe are all found in the pebble-form. We have very fine ſapphires alſo, partly pebble, partly cryſtal-ſhaped, from Biſnagar, Conanor, Calicut, and the iſland of Ceylon: theſe alſo are of all the ſhades of blue. And in Ceylon there are ſometimes found a ſort of baſtard gems, of a mixed nature between the ſapphire and ruby. The occidental are from Sileſia, Bohemia, and many other parts of Europe; but though theſe are often very beautiful ſtones, they are greatly inferior, both in luſtre and hardneſs, to the oriental.

SAPPHIRINE WATER, in the materia medica, alſo called blue eye-water, is thus prepared: Pour a pint of lime-water, made ſtrong and freſh, into a copper-veſſel, add to it a dram of crude ſal armoniac, and throw in ſome filings or ſmall pieces of copper, and let it ſtand till it has acquired a beautiful colour.

This is uſed as an eye-water; as alſo to deterge old ulcers: and ſometimes it is mixed with other things in injections in gonorrhœas.

SARABAITES, a ſort of monks among the ancient chriſtians, who did not reſort to the wilderneſs as others did, but lived publicly in cities. Two or three of them uſually dwelt together, but they had no rule or government; they however obſerved very ſtrict faſts; wore looſe ſleeves, wide ſtockings, coarſe clothes, frequently ſighed, and always bitterly inveighed againſt the clergy.

SARABAND, a muſical compoſition in triple time, the motions of which are ſlow and ſerious.

SARACENS, the inhabitants of Arabia; ſo called from the word *ſara*, which ſignifies a deſart, as the greateſt part of Arabia is: and this being the country of Mahomet, his diſciples were called Saracens.

SARAGOSSA, the capital of the province of Arragon in Spain: W. long. 1° 15′, and N. lat. 41° 32′.

SARCASM, in rhetoric, a keen bitter expreſſion which has the true point of ſatire, by which the orator ſcoffs and inſults his enemy: ſuch was that of the Jews to our Saviour, "He ſaved others, himſelf he cannot ſave."

SARCOCELE, in ſurgery, a ſpurious rupture, or hernia, wherein the teſticle is conſiderably tumified or indurated, like a ſcirrhus, or much enlarged by a fleſhy excreſcence, which is frequently attended with acute pains, and ſometimes ulceration, ſo as to degenerate at laſt into a cancerous diſpoſition. See SURGERY.

SARCOCOLLA, in pharmacy, a gum-reſin, which approaches greatly to the nature of the ſimple gums.

It is brought to us from Perſia and Arabia, in ſmall granules, moderately heavy, and of a whitiſh, browniſh, or reddiſh colour, very friable, of a faintiſh diſagreeable ſmell, and of an acrid and nauſeous taſte.

Hoffman abſolutely condemns the internal uſe of it. However, it is recommended in ophthalmias, and defluctions of a ſharp matter upon the eyes; and is generally ordered to be diſſolved in milk for this purpoſe.

SARCOLOGY is that part of anatomy which treats of the ſoft parts, *viz.* the muſcles, inteſtines, arteries, veins, nerves, and fat. See ANATOMY.

SARCOMA, in ſurgery, denotes any fleſhy excreſcence.

SARCOPHAGOUS MEDICINES, in ſurgery, *&c.* are thoſe which eat away proud fleſh, and otherwiſe called cauſtics. See CAUSTICS.

SARCOTICS, in ſurgery, medicines which generate fleſh in wounds.

SARDINIA, an iſland of the Mediterranean, ſituated between 8° and 10° E. long. and between 39° and 41° N. lat. It is about one hundred and forty miles long, and ſixty broad; and gives the title of king to the duke of Savoy, under whoſe dominion it is.

SARDIS, the ancient capital of Lydia, in Aſia, now in ruins.

SARDONYX, in natural hiſtory, a genus of ſemi-pellucid gems, of the onyx ſtructure, zoned or tabulated, and compoſed of the matter of the onyx variegated with that of the red or yellow carnelian. See CARNELIAN and ONYX.

SARGUS, in ichthyology. See SPARUS.

SARK, a little iſland between Guernſey and Jerſey, ſubject to Great Britain.

SAROTHRA, in botany, a genus of the pentandria trigynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; the capſule is coloured, and has three cells and one valve. There is but one ſpecies, a native of Virginia.

SARSAPARILLA, in botany. See SMILAX.

SARTORIUS, in anatomy. See ANATOMY, p. 207.

SARUM, or OLD SARUM, a borough-town of Wiltſhire, ſituated a little north of Saliſbury. It ſends two members to parliament.

SASSAFRAS, in botany. See LAURUS.

The wood is imported in large ſtraight blocks: it is ſaid to be warm, aperient, and corroborant; and frequently employed, with good ſucceſs, for purifying and ſweetening the blood and juices; for which purpoſe an infuſion, in the way of tea, is a very pleaſant drink: its oil is very fragrant, and poſſeſſes moſt of the virtues of the wood.

SATELLITE in aſtronomy, the ſame with a ſecondary planet, or moon. See ASTRONOMY.

SATRAPA, or SATRAPES, in Perſian antiquity, denotes an admiral; but more commonly the governor of a province.

SATTIN, a gloſſy kind of ſilk ſtuff, the warp of which is very fine, and ſtands out ſo as to cover the coarſer woof.

SATTINET, a ſlight thin kind of ſattin, commonly ſtriped, and chiefly uſed by the ladies for ſummer night-gowns.

SATURANTS, in pharmacy. See ABSORBENTS.

SATURATION, in chemiſtry, is the impregnating an acid with an alkali, or *vice verſa*, till either will receive no more, and the mixture will become neutral.

SATURDAY, the ſeventh or laſt day of the week ſo called from the idol Seater, worſhipped on this day by the ancient Saxons, and thought to be the ſame as the Saturn of the Latins.

SATUREIA in botany, a genus of the didynamia gymnoſpermia claſs. The lacinæ of the corolla are nearly equal; and the ſtamina are approximate. The ſpecies are nine, none of them natives of Britain.

The leaves of ſummer-ſavory are very pungent, warm, and aromatic; and afford, in diſtillation with water, a ſubtile eſſential oil. Both are eſteemed good in crudities of the ſtomach, aſthmas, and menſtrual obſtructions.

SATURN, in aſtronomy. See ASTRONOMY, p. 442.

SATURN,

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SATURN, in chemiſtry, &c. an appellation given to lead. See CHEMISTRY, p. 84, 136.

SATURN, in heraldry, denotes the black colour, in blazoning the arms of ſovereign princes.

SATURNALIA, in Roman antiquity, a feſtival obſerved about the middle of December, in honour of the god Saturn, whom Lucan introduces giving an account of the ceremonies obſerved on this occaſion thus: "During my whole reign, which laſts but for one week, no public buſineſs is done; there is nothing but drinking, ſinging, playing, creating imaginary kings, placing ſervants with their maſters at table, &c. There ſhall be no diſputes, reproaches, &c. but the rich and poor, maſters and ſlaves, ſhall be equal." &c.

On this feſtival the Romans ſacrificed bare-headed, contrary to their cuſtom at other ſacrifices.

SATURNINE, an appellation given to perſons of a melancholy diſpoſition, as being ſuppoſed under the influence of the planet Saturn.

SATYRE, in the heathen mythology, a fabulous kind of demi-god, or rural deity, of the ancient Romans, repreſented with goat's feet, and ſharp-pricked up ears.

SATYR, or SATIRE, in matters of literature, a diſcourſe or poem, expoſing the vices and follies of mankind.

The chief ſatyriſts among the ancients are Horace, Juvenal, and Perſius: thoſe among the moderns, Regnier, and Boileau, in French; and Dryden, Oldham, Rocheſter, Buckingham, Pope, Young, &c. among the Engliſh.

SATYRIUM, a genus of the gynandria diandria claſs. The nectarium reſembles a ſcrotum, placed behind the flower. The ſpecies are eight, 4 of them natives of Britain.

SAVANNA, a town and river of Georgia, in North-America: W. long. 81° 20′, N. lat. 32°.

SAUCISSE, or SAUSAGE, in the military art, a long train of powder, ſewed up in a roll of pitched cloth, about two inches in diameter, ſerving to ſet fire to mines.

SAUCISSON, in fortification, a maſs of large branches of trees bound together; and differing only from a faſcine, as this is compoſed of ſmall branches of twigs.

Sauciſſons are employed to cover the men, and to make epaulements.

SAVE, a large river of Germany, which riſing in Carinthia, runs eaſt through Carniola and Croatia, and dividing Sclavonia from Turky, diſcharges itſelf into the Danube at Belgrade.

SAVIN, in botany. See JUNIPERUS.

SAVIOUR, an appellation peculiarly given to Jeſus Chriſt, as being the true Meſſiah, and Saviour of the world.

Order of St SAVIOUR, a religious order in the Romiſh church, founded by St Bridget, about the year 1345; and ſo called from its being pretended that our Saviour himſelf dictated to the foundreſs its conſtitutions and rules.

According to the conſtitutions, this order is principally founded for religious women who pay a particular honour to the holy virgin: but there are ſome monks of the order, to adminiſter the ſacraments, and ſpiritual aſſiſtance to the nuns.

SAUMUR, a city of France, in the province of Orleanois, and duchy of Anjou; twenty-four miles eaſt of Anjou.

SAUNDERS. See SANTALUM.

SAVOLAXIA, a ſubdiviſion of Finland, in Ruſſia, ſituated between Cajania, Kexholm, Carelia, and Bothnia.

SAVORY, in botany. See SATUREIA.

SAVOUR. See TASTE.

SAVOY, a duchy, ſituated between France and Italy, on the weſt ſide of the Alps; bounded by the lake and territory of Geneva, on the north; by Switzerland and Piedmont, on the eaſt; by another part of Piedmont and Dauphine, on the ſouth; and by Franche Compte and Dauphine, on the weſt.

SAUVAGESIA, in botany, a genus of the pentandria monogynia claſs. The calix conſiſts of five leaves, and the corolla of five fimbriated petals; the nectarium has five leaves, lying alternately between the petals; and the capſule has one cell. There is but one ſpecies, a native of Jamaica.

SAW, an inſtrument which ſerves to cut into pieces ſeveral ſolid matters; as wood, ſtone, ivory, &c.

The beſt ſaws are of tempered ſteel ground bright and ſmooth: thoſe of iron are only hammer hardened: hence, the firſt, beſides their being ſtiffer, are likewiſe found ſmoother than the laſt. They are known to be well hammered by the ſtiff bending of the blade; and to be well and evenly ground, by their bending equally in a bow.

SAW-FISH. See SQUALUS.

SAXIFRAGA, in botany, a genus of the decandria digynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; the capſule has a double beak and one cell. The ſpecies are 38, nine of them natives of Britain.

The tuberoſities at the root of the granulata or white-flowered ſaxifrage are kept in the ſhops, under the name of ſaxifrage-ſeeds; they are diuretic and attenuant; and therefore good in nephritic caſes and obſtructions of the menſes and viſcera.

SAXONY, the name of two circles of the German empire, diſtinguiſhed by the epithets Upper and Lower. The circle of Upper Saxony comprehends the duchy of Saxony, the marquiſates of Miſnia, Luſatia, and Brandenburg, and the duchies of Pomerania, Sax Hall, Sax Altemburg, Sax Merſburg, and Sax Naumburg. The circle of Lower-Saxony comprehends the duchies of Mecklenburg, Holſtein, Lawenburg, Lunenburg, Zell, Bremen, Brunſwic, Hanover, and Magdeburg; the principalities of Verden and Halberſtat, and the biſhoprick of Hildeſheim.

SAY, or SAYE, in commerce, a kind of ſerge or woollen ſtuff, much uſed abroad for linings, and by the religious for ſhirts: with us it is uſed for aprons by ſeveral ſorts of artificers, being uſually dyed green.

SCABIOSA, in botany, a plant of the tetrandria monogynia claſs. The common calix conſiſts of many leaves, and the proper one is double; the receptacle is paleaceous. The ſpecies are 25, three of them natives of Britain, *viz.* the ſucciſa, or devil's bit; the arvenſis, or common field ſcabious; and the columbaria, or leſſer field ſcabious.

SCAFFOLD, among builders, an aſſemblage of planks and boards, ſuſtained by treſſels and pieces of wood fixed in the wall; whereon maſons, brick-layers, &c. ſtand to work in building high walls, &c. and plaſterers in plaſtering ceilings, &c.

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Scaffold alſo denotes a timber-work raiſed in the manner of an amphitheatre, for the more commodious viewing any ſhew or ceremony: it is alſo uſed for a little ſtage, raiſed in ſome public place, whereon to behead criminals.

SCAGEN, a promontory of North Jutland, at the entrance of the Scagerrac ſea, or paſſage out of the ocean into the Baltic ſea: E. lon. 10°, N. lat. 58°.

SCALADO, or SCALADE, in the art of war, a furious aſſault made on the wall or rampart of a city, or other fortified place, by means of ladders, without carrying on works in form to ſecure the men.

SCALE, a mathematical inſtrument, conſiſting of ſeveral lines drawn on wood, braſs, ſilver, &c. and variouſly divided, according to the purpoſes it is intended to ſerve; whence it acquires various denominations, as the plain ſcale, diagonal ſcale, plotting ſcale. See GEOMETRY.

SCALE, in muſick, is a denomination given to the arrangement of the ſix ſyllables invented by Guido Aretine, *ut*, *re*, *mi*, *fa*, *ſol*, *la*, called alſo gammut. See MUSICK.

SCALENE, or SCALENOUS TRIANGLE, *ſcalenum*, in geometry, a triangle whoſe ſides and angles are unqual. See GEOMETRY.

SCALENUS, in anatomy. See ANATOMY, p. 214.

SCALPEL, in ſurgery, a kind of knife uſed in anatomical diſſections and operations in ſurgery.

SCALPER, or SCALPING-IRON, a ſurgeon's inſtrument uſed for ſcraping foul carious bones.

SCALPRA DENTALIA, inſtruments uſed by the ſurgeons to take off thoſe black, livid, or yellow cruſts, which infeſt the teeth, and not only looſen and deſtroy them, but taint the breath.

SCAMMONY, a concreted vegetable juice of a ſpecies of convolvulus, partly of the reſin, and partly of the gum-kind.

The Aleppo ſcammony is of a ſpongy texture, light and friable: it is of a faint diſagreeable ſmell, and its taſte is bitteriſh, very nauſeous, and acrimonious. The Symrna ſcammony is conſiderably hard and heavy, of a black colour, of a much ſtronger ſmell and taſte than the former, otherwiſe it much reſembles it.

Scammony is in great eſteem and frequent uſe. It is an ingredient in many compoſitions of the ſhops; and theſe are preſcribed, with other cathartics, for purging off ſerous humours. It is in general, however, a better purge for robuſt people than for thoſe of more delicate conſtitutions; though, with the correctives with which it is joined, it is given with ſafety and ſucceſs to children.

SCANDALUM MAGNATUM, in law, is a defamatory ſpeech or writing to the injury of a perſon of dignity; for which a writ that bears the ſame name is granted for the recovery of damages.

SCANDEROON, a port-town of Aleppo, in Aſiatick Turky, ſituated on the coaſt of the Leſſer Aſia: E. long. 36°, N. lat. 37° 15′.

SCANDINAVIA, a large country which conſiſted of Sweden, Denmark, and Norway, which were ſometimes under the government of one prince; but is now under the dominion of Sweden and Denmark.

SCANDIX, in botany, a genus of the pentandria digynia claſs. The corolla is of an irregular ſhape; the fruit is ſubulated; the petals are entire; and the floſcules of the diſc are generally males. There are eight ſpecies, two of them natives of Britain, *viz.* the pecten, ſhepherds needle, or venus's comb; and the onthriſcus, or ſmall hemlock ſhervill.

SCANNING, in poetry, the meaſuring of a verſe by feet, in order to ſee whether or no the quantities be duly obſerved.

The term is chiefly uſed in regard to the Greek and Latin verſes. Thus an hexameter verſe is ſcanned, by reſolving it into ſix feet; a pentameter, by reſolving it into five feet, &c.

SCAPE-GOAT, in Jewiſh antiquity, the goat which was ſet at liberty on the great day of expiation.

Spencer is of opinion, that the ſcape-goat was called Azazel, becauſe it was ſent to Azazel, *i. e.* the devil; the reaſons of which ceremony, he takes to be theſe: 1. That the goat, loaded with the ſins of the people, and ſent to Azazel, might denote the miſerable condition of the ſinners. 2. The goat was ſent thus loaded to the dæmons, to ſhew that they were impure, and to deter the people from worſhipping them. 3. That the goat ſent to Azazel ſufficiently expiating the ſins of the Iſraelites, they might the more willingly abſtain from the expiatory ſacrifices of the heathens.

SCAPHOIDES, or os naviculare. See ANATOMY, p. 186.

SCAPULA, in anatomy. See ANATOMY, p. 176.

SCAPULAR, in anatomy, a name given to two pair of arteries and as many veins. See ANATOMY, Part III. and IV.

SCAPULAR, or SCAPULARY, a part of the habit of ſeveral religious orders in the church of Rome, worn over the gown, as a badge of peculiar veneration for the bleſſed Virgin. It conſiſts of two narrow breadths or ſlips of cloth, covering the back and the breaſt, and hanging down to the feet.

The devotees of the ſcapulary celebrate its feſtival on the 16th of July.

SCARABÆUS, the BEETLE, in zoology, a genus of inſects, of the coleoptera order: the antennæ of the beetles are of a clavated figure, and fiſſile logitudinally, and their legs are frequently dentated. There are 87 ſpecies.

SCARBOROUGH, a borough and port town of Yorkſhire, thirty-ſeven miles north-eaſt of York.

It ſends two members to parliament, and is famous for a medicinal ſpring, which has been the ſubject of great conteſts and diſputes among the phyſical people; all allowing it conſiderable virtues, but ſome attributing them to one ingredient, others to another.

SCARIFICATION, in ſurgery, the operation of making ſeveral inciſions in the ſkin by means of lancets, or other inſtruments, particularly the cupping inſtrument. See SURGERY.

SCARLET, a beautiful bright red colour.

In painting in water-colours, minium mixed with a little vermilion produces a good ſcarlet: but if a flower in a print is to be painted of a ſcarlet-colour, the lights as well as the ſhades ſhould be covered with minium, and the ſhaded parts finiſhed with carmine, which will produce an admirable ſcarlet.

SCARP, in fortification, is the the interior talus, or ſlope of the ditch next the place, at the foot of the rampart.

SCARP, in heraldry, the ſcarf which military commanders wear for ornament.

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It is borne ſomewhat like a battoon ſiniſter, but is broader than it, and is continued out to the edges of the field: whereas the battoon is cut off at each end. See Plate CXLVII. fig. 16.

SCARPANTO, an iſland in the Mediterranean, twenty miles ſouth-weſt of Rhodes: E. long. 27°, N. lat. 36°.

SCARUS, in ichthyology. See LABRUS.

SCAVENGERS, two officers annually choſen in every pariſh in London and its ſuburbs by the church-wardens, conſtables, and other inhabitants, to hire perſons called rakers, with carts, to clean the ſtreets, and carry away the dirt and filth, with the aſhes and duſt from every houſe.

SCENE, in its primary ſenſe, denoted a theatre, or the place where dramatic pieces and other public ſhews were exhibited: for it does not appear that the ancient poets were at all acquainted with the modern way of changing the ſcenes in the different parts of the play, in order to raiſe the idea of the perſons repreſented by the actors being in different places.

The original ſcene for acting of plays was as ſimple as the repreſentations themſelves: it conſiſted only of a plain plot of ground proper for the occaſion, which was in ſome degree ſhaded by the neighbouring trees, whoſe branches were made to meet together, and their vacancies ſupplied with boards, ſticks, and the like; and to complete the ſhelter, theſe were ſometimes covered with ſkins, and ſometimes with only the branches of other trees newly cut down, and full of leaves. Afterwards more artificial ſcenes or ſcenical repreſentations were introduced, and paintings uſed inſtead of the objects themſelves. Scenes were then of three ſorts; tragic, comic, and ſatyric. The tragic ſcene repreſented ſtately magnificent edifices, with decorations of pillars, ſtatues, and other things ſuitable to the palaces of kings: the comic exhibited private houſes with balconies and windows, in imitation of common buildings: and the ſatyric was the repreſentation of groves, mountains, dens, and other appearances; and theſe decorations either turned on pivots, or ſlid along grooves, as thoſe in our theatres.

Scene is alſo a part or diviſion of a dramatic poem. Thus plays are divided into acts, and acts are again ſubdivided into ſcenes; in which ſenſe the ſcene is properly the perſons preſent at, or concerned in, the action on the ſtage at ſuch a time: whenever, therefore, a new actor appears, or an old one diſappears, the action is changed into other hands; and therefore a new ſcene then commences.

SCENIC GAMES, among the ancients, were entertainments exhibited on the ſcena or theatre, including plays, dancing, and other theatrical performances.

SCENOGRAPHY, in perſpective, the repreſentation of a body on a perſpective plane; or, a deſcription thereof in all its dimenſions, ſuch as it appears to the eye. See PERSPECTIVE.

SCEPTER, a kind of royal ſtaff, or battoon, borne by kings on ſolemn occaſions, as an enſign of command and authority

SCEPTICISM, the doctrines and opinions of the ſceptics, whoſe diſtinguiſhing tenet was, that all things are uncertain and incomprehenſible, and that the mind is never to aſſent to any thing, but to remain in perpetual doubt and ſuſpenſe. This doctrine was alſo called pyrrhoniſm, from the name of its author. See PYRRHONIANS.

SCHAFFHOUSE, the capital of the canton of Schaffhouſe, one of the moſt northern cantons of Switzerland: E. long. 8° 40′, N. lat. 47° 42′.

SCHALHOLT, the capital of Iceland, ſubject to Denmark: W. long. 19°, N. lat. 64° 30′.

SCHAMACHIA, a city of Perſia, in the province of Chirvan, ſituated on the weſt ſide of the Caſpian ſea, in E. long. 50′, N. lat. 41°.

SCHELD, a river which riſes in the confines of Picardy, and runs north-eaſt by Cambray, Valenciennes, Tournay, Oudenarde, &c. and receiving the Lis at Ghent, runs eaſt by Dendermond, and then north to Antwerp; below which city it divides into two branches; one called the Weſter-Scheld, which ſeparates Flanders from Zeland, and diſcharges itſelf into the ſea near Fluſhing; and the other called the Oſter-ſcheld, which runs by Bergen-op-zoom, and afterwards between the iſlands Beveland and Schowen, and a little below falls into the ſea.

SCHELLING, an iſland of Holland, at the entrance of the Zuyder ſea, between Flie Iſland and Ameland: E. long. 5° 20′, N. lat. 53° 34′.

SCHEMNITZ, capital of the mine towns in Upper Hungary, ſixty miles north-eaſt of Preſburg.

SCHENECTIDA, a fortreſs of New-York, in America, ſituated on Hudſon's River, in the province of Albany, a hundred miles north of New York city.

SCHETLAND, about forty iſlands, which conſtitute part of the country of Orkney, or the Orcades, in Scotland, valuable on account of the herring-fiſhery on their ſhores: ſituated between 1° eaſt and 2° weſt longitude, and between 61° and 62° of north latitude.

SCHIRAS, or SHERAS, a city of Perſia, in the province of Fars, 180 miles ſouth of Iſpahan; reckoned the ſecond city in that kingdom.

SCHISM, a ſeparation, or breaking off from communion with any church; on account of ſome diſagreement in matters of faith or diſcipline.

SCHOENUS, in botany, a genus of the triandria monogynia claſs. The glumæ are paleaceous, and have but one valve; it has no corolla, and but one round ſeed. The ſpecies are 13, five of them natives of Britain.

SCHOLASTIC, ſomething belonging to the ſchools. See SCHOOL.

SCHOLIAST, a grammarian, who writes ſcholia, that is, notes, gloſſes, &c. upon ancient authors, who have written in the learned languages. See the next article.

SCHOLIUM, a note, annotation, or remark, occaſionally made on ſome paſſage, propoſition, or the like. This term is much uſed in geometry, and other parts of mathematics, where, after demonſtrating a propoſition, it is cuſtomary to point out how it might be done ſome other way, or to give ſome advice, or precaution, in order to prevent miſtakes, or add ſome particular uſe, or application thereof.

SCHOOL, a public place, wherein the languages, or arts and ſciences are taught. Thus we ſay, grammar-ſchool, writing-ſchool, &c.

SCHWALBASH, a town of Germany, in the circle of the Upper Rhine, and in the territory of the Wetteraw, and county of Naſſau, eight miles north of Mentz.

SCHWALBEA, in botany, a genus of the didynamia angioſpermia claſs. The calix conſiſts of four ſegments, the

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the ſuperior tube being leaſt, and the loweſt largeſt. There is but one ſpecies, a native of America.

SCHWARTSBURG, a town of Germany, in the circle of Upper Saxony, and landgrave of Thuringia, eight miles ſouth-eaſt of Gotha.

SCHWARTZENBURG, a town of Germany, in the circle of Franconia, twenty miles eaſt of Wurtſburg.

SCHWATS, a town of Germany, in the county of Tyrol, ſituated on the river Inn, twenty miles north-eaſt of Inſpruc.

SCHWEIDNITZ, a town of Bohemia, in the duchy of Sileſia, capital of a duchy of the ſame name, ſituated twenty-ſix miles ſouth of Breſlaw.

SCHWEINFURT, an imperial city of Germany, in the circle of Franconia, and biſhopric of Wurtſburg, ſituated on the river Maine: in E. long. 10° 15′, N. lat. 50° 15′.

SCIÆNA, in ichthyology, a genus belonging to the order of thoracici. The membrane of the gills has ſix rays; the opercula and whole head are ſcaly. There are five ſpecies.

SCIARRI, in natural hiſtory, the matter which runs down in burning torrents from the craters of volcanos, and which probably contains mineral and metallic particles, it being ponderous and hard.

Some of the ſciarri are coarſe, and others fine and poliſhed on the ſurface; ſome of them are black, others grey, others reddiſh, and others of the colour of iron, and many of them have coverings of pure ſulphur over their whole ſurface. They ſeem to be the reſult of many ſorts of minerals melted together.

SCIATICA. See MEDICINE, p. 128.

SCIENCE, in philoſophy, denotes any doctrine, deduced from ſelf-evident and certain principles, by a regular demonſtration.

SCILLA, the SQUILL, in botany, a genus of the hexandria monogynia claſs. The corolla conſiſts of ſix open, deciduous petals; and the filaments reſemble threeds. There are eight ſpecies, two of them natives of Britain, *viz.* the bifolia, or vernal ſtar-hyacinth; and the autumnalis, or leſſer autumnal ſtar-hyacinth.

The middle part of the root of the ſcilla maritima, a native of Spain, is only uſed in medicine: the apothecaries cut the root perpendicularly in two; and ſeparating the heart and the outer parts, they expoſe the others to dry. This root is extremely acrid, attenuant, and diſſolvent: it is apt to prove emetic in whatever form it is given; but this may be prevented, by adding a few grains of cinnamon to it: it then becomes a powerful medicine in all obſtructions of the viſcera; it promotes urine and the menſes, and cuts the tough phlegm which almoſt choaks in aſthmas and many other diſorders of the breaſt.

SCILLY, a cluſter of iſlands and rocks, ſituated in the Atlantic ocean: W. long. 7°, N. lat. 50°.

SCIO, an iſland of Turky, in the Archipelago, ſituated in E. long 27°, N. lat. 38° 15′.

SCIOPTIC, a ſphere, or globe of wood, with a circular hole or perforation, wherein a lens is placed. It is ſo fitted, that, like the eye of an animal, it may be turned round every way, to be uſed in making experiments of the darkened room.

SCIRO, an iſland of Turky, in the Archipelago, ſituated E. long. 25°, N. lat. 38° 15′.

SCIRPUS, in botany, a genus of the triandria monogynia claſs. The glumæ are paleaceous, and imbricated; it has no corolla, and but one beardleſs ſeed. The ſpecies are 27, ten of which are natives of Britain.

SCIRRHUS, in ſurgery and medicine, a hard tumour of any part of the body, void of pain, ariſing from the inſpiſſation and induration of the fluids contained in a gland; though it may appear in any other part, eſpecially in the fat, being one of the ways wherein an inflammation terminates. See MEDICINE and SURGERY.

SCIURUS, the SQUIRREL, a genus of quadrupeds belonging to the order of glires. It has two fore-teeth in each jaw, the ſuperior ones ſhaped like wedges, and the inferior ones compreſſed. There are eleven ſpecies. The vulgaris, or common ſquirrel, which is a native of moſt ſouthern parts of Europe, has a pencil of hairs on the top of the ears, four toes on the fore-feet, and five on the hind ones: In the ſummer, it is of a reddiſh colour, with a white belly; in the winter, it is of a blueiſh aſh-colour. The ſquirrel is a very active animal; it feeds upon nuts, berries, *&c.* which it carries to its mouth by the fore-feet: It lays up its ſuperfluous food in holes; and makes a round neſt of moſs.

SCLAREA, in botany. See SALVIA.

SCLAVONIA, a province ſubject to the houſe of Auſtria, and bounded on the north-eaſt by the rivers Drave and Danube, which ſeparate it from Hungary; being about two hundred miles long, and ſixty broad.

It takes its name from the Sclavi, an ancient people of European Scythia; from whom is likewiſe derived the Sclavonic language, which is ſaid to be the moſt extenſive language in the world, except the Arabic; as being the common mother of the Ruſſian, Hungarian, Poliſh, Bulgarian, Carinthian, Bohemian, *&c.* languages.

SCLERANTHUS, in botany, a genus of the decandria digynia claſs. The calix conſiſts of one leaf; it has no corolla; and the ſeeds are two, incloſed in the calix. There are three ſpecies, two of them natives of Britain, *viz.* the annuus, german knot-graſs, or annual knawel; and the perennis, or perennial knawel.

SCLEROTICA, in anatomy. See ANATOMY, p. 289.

SCLEROTICS, medicines proper to harden and conſolidate the fleſh of the parts to which they are applied; as purſlain, houſe-leek, fig-wort, garden night-ſhade, *&c.*

SCOLOPAX, in ornithology, a genus belonging to the order of grallæ. The beak is cylindrical, obtuſe, and longer than the head; the noſtrils are linear; the face is covered; and the feet have four toes. There are 18 ſpecies.

SCOLOPENDRA, in zoology, a genus of inſects belonging to the order of aptera. The feet are very numerous, being as many on each ſide as there are joints in the body; the antennæ are ſetaceous; there are two jointed pappi; and the body is depreſſed. There are eleven ſpecies.

SCOLYMUS, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is paleaceous; the calix is imbricated and prickly; and it has no pappus. There are two ſpecies, both natives of Italy.

SCOMBER, in ichthyology, a genus belonging to the order of thoracici. The head is ſmooth and compreſſed; and there are ſeven rays in the gill-membrane. The ſpecies are ten.

SCONE,

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SCONE, or Scoon, a town of Scotland, near Perth, remarkable for being the place where the kings of Scotland were crowned.

SCOPARIA, in botany, a genus of the tetrandria monogynia claſs. The calix conſiſts of four ſegments; the corolla is rotated, with four ſegments; and the capſule has one cell, and two valves, containing many ſeeds. There are two ſpecies none of them natives of Britain.

SCOPER, or Scuper-holes, in a ſhip, are holes made through the ſides, cloſe to the deck, to carry off the water that comes from the pump.

SCORBUTUS, the Scurvy. See Medicine, p. 106.

SCORDIUM. See Teucrium.

SCORIA, or dross, among metallurgiſts, is the recrements of metals in fuſion; or, more determinately ſpeaking, is that maſs which is produced by melting metals and ores, and when cold is brittle, and not diſſoluble in water; being properly a kind of glaſs.

SCORIFICATION, in metallurgy, is the art of reducing a body, either entirely, or in part, into ſcoria.

SCORPÆNA, in ichthyology, a genus belonging to the order of thoracici. The head is large and ſharp; the eyes are near each other; there are teeth in the jaws, palate and fauces: and there are ſeven rays in the membrane of the gill. The ſpecies are three.

SCORPIO, in zoology, a genus of inſects belonging to the order of aptera. It has eight feet, beſides two frontal claws; the eyes are eight in number, three on each ſide of the thorax, and two on the back; it has two claw-ſhaped palpi, a long jointed tail, with a pointed weapon at the extremity; it has likewiſe two combs ſituate betwixt the breaſt and abdomen. There are ſix ſpecies, all natives of ſouthern climates.

Scorpio, in aſtronomy. See Astronomy, p 487.

SCORPIURUS, in botany, a genus of the diadelphia decandria claſs. The pod is cylindrical, revolute, and intercepted with iſthmi. There are four ſpecies, none of them natives of Britain.

SCORZONERA, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is naked; the pappus is plumoſe; and the calix is imbricated with ſcales membranaceous at the edges. There are 11 ſpecies, none of them natives of Britain.

SCOT, a cuſtomary contribution laid upon all ſubjects according to their abilities. Whoever were aſſeſſed to any contribution, though not by equal portions, were ſaid to pay ſcot and lot.

SCOTIA, in architecture, a ſemicircular cavity or channel between the tores, in the baſes of columns. See Architecture.

SCOTISTS, a ſect of ſchool-divines and philoſophers, thus called from their founder J. Duns Scotus, a Scotiſh cordelier, who maintained the immaculate conception of the virgin or that ſhe was born without original ſin, in oppoſition to Thomas Aquinas and the Thomiſts.

SCOTLAND, excluſive of the iſlands, is ſituated between 1° and 6° W. long. and between 54° 30′ and 58° 30′ N. lat. being about three hundred miles long from north to ſouth and from fifty to one hundred and fifty miles broad, from eaſt to weſt.

Since the union with England, Scotland is divided into thirty-three ſhires, or counties, which all together ſend only thirty knights to parliament, by reaſon the ſhires of Bute and Cathneſs chuſe only alternately, or every other parliament, in their turns; as do thoſe of Cromarty and Nairn, Clackmannan and Kinroſs.

The royal boroughs of Scotland are ſixty-five, but ſo claſſed as to ſend only fifteen burgeſſes to parliament.

New Scotland, *Nova Scotia*, one of the Britiſh colonies in North America, is ſituated between 62° and 72° W. long. and between 43° and 51° N. lat. being bounded by the river of St Laurence on the north and north-weſt; by the bay of St Laurence, and the Atlantic Ocean, on the eaſt; by the ſame ocean, and New-England, on the ſouth; and by Canada, on the weſt.

SCOTOMIA, in medicine, a dizzineſs or ſwimming in the head, wherein the animal ſpirits are ſo whirled about, that external objects ſeem to turn round.

SCRATCH pans, in the Engliſh ſalt-works, a name given to certain leaden pans, which are uſually made about a foot and half long, a foot broad and three inches deep, and have a bow, or circular handle of iron, by which they may be drawn out with a hook, when the liquor in the pan is boiling.

The uſe of theſe pans is to receive a calcarious earth, of the nature of that which incruſts our tea kettles, which ſeparates from the water in boiling; this ſubſtance they call ſcratch; and theſe pans, being placed at the corners of the ſalt-pan, where the heat is leaſt violent, catch it as it ſubſides there.

SCREW, one of the ſix mechanical powers. See Mechanics, p. 49.

SCRIBE, an officer among the Jews whoſe buſineſs was to write; of which there were three kinds: the firſt and principal of which were the ſcribes of the law, whoſe office was to write and interpret ſcripture; theſe were in great credit and eſteem among the Jews, and had even the precedency of the prieſts and ſacrificers, and their deciſions were received with almoſt the ſame reſpect as the law of God itſelf: the ſecond kind, properly called ſcribes of the people, were a ſort of magiſtrates: and the third were public notaries, or ſecretaries of the council; which were the leaſt conſiderable.

The ſcribes, among the Romans, wrote out decrees, or acts, and made out authentic copies of them.

SCRIBING, in joinery, *&c.* is a term uſed when one ſide of a piece of ſtuff is to be fitted to another that is irregular.

SCRIPTURE, an appellation given, by way of eminence, to the ſacred and inſpired writings of the Bible. See Bible

SCROPHULA, in medicine. See Medicine, p. 137, *&c*

SCROPHULARIA, in botany, a genus of the didynamia angiolpermia claſs. The calix has five ſegments; the corolla is ſomewhat globular; and the capſule has two cells. There are 14 ſpecies, four of them natives of Britain, *viz.* the nodoſa, or knobby-rooted figwort; the aquatica, or water figwort; the ſcorodonia, or balm-leaved figwort; and the vernalis, or yellow figwort.

SCROTUM, in anatomy. See Anatomy, p 271.

SCRUPI, in natural hiſtory, foſſils, formed into large detached maſſes without cruſts, and compoſed of a variouſly debaſed cryſtalline matter.

SCRUPLE, a weight equal to the third part of a dram, or to twenty grains.

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SCRUTINY, a ſtrict examination of any thing.

SCULPTURE, an art by which, in taking away, or adding to matter, all ſorts of figures are formed by the hand, either in the ſtone, wood, wax, or metal. In its full latitude it ſignifies both the art of working in creux, properly called engraving; and of working in relievo, which is more ſtrictly called ſculpture.

The firſt works in ſculpture were with clay, not only in making ſtatues, but in forming models; and to this day a ſculptor never undertakes any thing conſiderable, without forming a model, either in clay or wax. In making figures of theſe materials, they begin and finiſh their work with their hands, uſing only three or four pieces of wood, which are roundiſh at one end, and at the other flat, with a ſort of claws and teeth, which are to ſmooth and ſcratch the work. For waxen models, to every pound of wax add half a pound colophony: ſome add turpentine, and melt it together with oil of olives; more or leſs of the latter being uſed as they would have the matter harder or ſofter: ſome alſo add a little vermilion, to give it a colour: this is wrought and moulded with the fingers like clay.

For ſculpture in wood, which we properly call carving, the firſt thing required is to chuſe wood proper for the work the ſculptor is to perform. If it be any thing large, and that requires a great deal of ſtrength and ſolidity, the hardeſt and moſt durable wood is to be choſen; and for ſmaller works and ornaments, the ſofter wood is uſed; but it muſt be ſuch, however, as is firm and cloſe: for a large work, though it be only a ſingle figure, it is better to make uſe of ſeveral pieces of wood, or bits of board, glued together, than of one whole piece, which is more liable to crack: for a thick piece of wood may not be dried to the heart, however it may appear on the outſide.

In ſculpture in marble and other ſtone, the firſt thing to be done is to ſaw out a block of marble, of the bigneſs of the work to be performed; and this being done, the ſuperfluities are to be taken off by a ſtubbed point and a heavy maller; thus bringing it near the meaſures required, the ſculptor reduces it ſtill nearer with a finer tool, called a dog's tooth, it having two points, but one not ſo ſharp as the other. After this he makes uſe of his gradine, which is a flat cutting tool, with three teeth; he then takes off, with a ſmooth chiſſel, the ſcratches the gradine left on the marble, and uſes it with dexterity and delicacy, to give ſoftneſs and tenderneſs to his figure; till at length, taking raſps of different degrees of fineneſs, the work is gradually rendered fit for poliſhing. To poliſh the work, the ſculptor uſes pumice-ſtone and ſmalt; then he goes over it with tripoli; and when he would give it more luſtre, rubs it with leather and ſtraw aſhes. There are ſeveral other tools uſed by ſculptors, adapted to the different parts of the work, and the nature of the ſtone they make uſe of. As the models of clay ſhrink as they grow dry, whenever ſculptors undertake a conſiderable piece of work, they only uſe the model for making a mould of plaiſter or ſtucco, in which is formed a figure of the ſame matter, which ſerves them thenceforth for a model, and by which they adjuſt all their meaſures and proportions. To proceed the more regularly, on the head of the model they place an immoveable circle divided into degrees, with a moveable rule or index, fixed in the centre of the circle, and divided alſo into equal parts: from the end of the rule hangs a line with a plummet, which ſerves to take all the points, to be tranſferred thence to the block of marble, from whoſe top hangs another plummet, like that of the model. But there are ſome excellent ſculptors, who diſapprove of this method; urging, that the ſmalleſt motion of the model changes their meaſures, for which reaſon they chuſe rather to take all their meaſures with the compaſſes.

SCUM, properly denotes the impurities which, a liquor, by boiling, caſts up to the ſurface.

The term *ſcum* is alſo uſed for what is more properly called the ſcoria of metals.

SCURVY, in medicine. See MEDICINE, p. 106.

SCURVY GRASS, in botany. See COCHLEARIA.

SCUTELLARIA, in botany, a genus of the didynamia gymnoſpermia claſs. The calix is entire on the edge, is ſhut after the flowering, and operculated. The ſpecies are 13, two of them natives of Britain, *viz.* the galericulata, or hooded willow-herb; and the minor, or leſſer hooded willow-herb.

SCUTIFORME os, in anatomy, the ſame with rotula. See ANATOMY, p. 185.

SCUTIFORMIS CARTILAGO, in anatomy, the ſame with the thyroid cartilage. See ANATOMY, p. 300.

SCUTTLES, in a ſhip, ſquare holes cut in the deck, big enough to let in the body of a man, ſerving to let people down into any room below upon occaſion, or from one deck to another.

SCYTHIA. The northern parts of Europe and Aſia were anciently ſo called, which afterwards obtained the name of Tartary.

SEA, is frequently uſed for that vaſt tract of water encompaſſing the whole earth; but is more properly a part or diviſion of theſe waters, and is better defined a leſſer aſſemblage of water, which lieth before and waſheth the coaſts of ſome particular countries from whence it is generally denominated, as the Iriſh ſea, the Mediterranean ſea, the Arabian ſea, *&c.*

What proportion the ſuperficies of the ſea bears to that of the land is not preciſely known, though it is ſaid to be ſomewhat more than two thirds. As the waters of the earth muſt neceſſarily riſe to the ſurface thereof, as being ſpecifically lighter than the earth, it was neceſſary there ſhould be large cavities therein for receptacles to contain them; otherwiſe they would have overſpread all the ſuperficies of the earth, and ſo have rendered it utterly uninhabitable for terreſtrial animals; for the centre of the earth being the common centre of gravity, and the nature of fluids being ſuch that they equally yield to equal powers, and the power of attraction being every where equal at equal diſtances from the centre, it follows, that the ſuperficial parts of the water will every where conform themſelves to an equidiſtant ſituation from the centre, and conſequently will form the ſurface of a ſphere ſo far as they extend. Hence, that the ſea ſeems higher than the earth or land, reſults from the fallacy of viſion, whereby all objects, and the parts of land as well as ſea, the farther they are off from us, the higher they appear; the reaſon of all which is plain from optics: for it is well known, that the denſer any medium is through which we behold objects, the greater is the refraction, or the more their images appear above the horizontal level; alſo the greater quantity of the medium the rays paſs through, the

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the more will they be bent from their firſt direction; on both theſe accounts the appearances of things remote, and on the ſea, will be ſomewhat above the horizon, and the more ſo as they are the more remote.

With regard to the depth or profundity of the ſea, Varenius affirms, that it is in ſome places unfathomable; and in other places very various, being in certain places $\frac{1}{10}$, $\frac{1}{5}$, $\frac{4}{10}$, $1\frac{1}{10}$ $2\frac{2}{10}$ $4\frac{1}{5}$ Engliſh miles, in other places deeper, and much leſs in bays than in oceans. In general, the depths of the ſea bear a great analogy to the height of mountains on the land, ſo far as is hitherto diſcovered.

There are two principal reaſons why the ſea doth not increaſe by means of rivers, &c. falling every where into it. The firſt is, becauſe waters return from the ſea by ſubterranean cavities and aqueducts, through various parts of the earth. Secondly, becauſe the quantity of vapours raiſed from the ſea, and falling on the land, only cauſe a circulation, but no increaſe of water. It hath been found by calculation, that in a ſummer's day there may be raiſed in vapours, from the Mediterranean ſea, 528000000 tuns of water; and yet this ſea receiveth not, from all its nine great rivers, above 1827000000 tuns per day, which is but a third part of what is exhauſted in vapours.

With regard to the ſaltneſs of the ſea-water, it is very rationally judged to ariſe from great multitudes both of mines and mountains of ſalt, diſperſed here and there in the depths of the ſea. Dr Halley ſuppoſes that it is probable the greateſt part of the ſea ſalt, and of all ſalt lakes, as the Caſpian ſea, the Dead ſea, the lake of Mexico, and the Titicaca in Peru, is derived from the water of the rivers which they receive; and ſince this ſort of lakes has no exit or diſcharge, but by the exhalation of vapours; and alſo ſince theſe vapours are entirely freſh, or devoid of ſuch particles; it is certain the ſaltneſs of the ſea and ſuch lakes muſt, from time to time increaſe, and therefore the ſaltneſs at this time is greater than at any time heretofore. He further adds, that if, by experiments made in different ages, we could find the different quantity of ſalt which the ſame quantity of water (taken up in the ſame place, and in all other the ſame circumſtances) would afford, it would be eaſy from thence, by rules of proportion, to find the age of the world very nearly, or the time wherein it has been acquiring its preſent ſaltneſs.

With regard to the uſe of this ſalt property of ſea-water, it is obſerved, that the ſaltneſs of the ſea preſerves its waters pure and ſweet, which otherwiſe would corrupt and ſtink like a filthy lake, and conſequently that none of myriads of creature that now live therein could then have a being. From thence alſo the ſea-water becomes much heavier, and therefore ſhips of greater ſize and quantity may be uſed thereon. Salt water alſo doth not freeze ſo ſoon as freſh water, whence the ſeas are more free for navigation. We have lately had publiſhed a diſſertation, by Dr Ruſſel, concerning the medical uſes of ſea-water in diſeaſes of the glands, &c. wherein the author premiſes ſome obſervations upon the nature of ſea water, conſidered as impregnated with particles of all the bodies it paſſes over, ſuch as ſubmarine plants, fiſh, ſalts, minerals, &c. and ſaturated with their ſeveral effluvia, to enrich it, and keep it from putrefaction: hence this fluid is ſuppoſed to contract a ſoapineſs, and the whole collection, being pervaded by the ſulphureous ſteams paſſing through it, to conſtitute what we call ſea-water, the confeſſed diſtinguiſhing characteriſtics of which are ſaltneſs, bitterneſs, nitroſity, and unctuoſity; whence the author concludes, that it may be juſtly expected to contribute ſignally to the improvement of phyſic. The caſes in which our author informs us we are to expect advantage from ſea-water, are, 1. In all recent obſtructions of the glands of the inteſtines and meſentery. 2. All recent obſtructions of the pulmonary glands, and thoſe of the viſcera, which frequently produce conſumptions. 3 All recent glandular ſwellings of the neck, or other parts. 4. Recent tumours of the joints, if they are not ſuppurated, or become ſcirrhous, or cancerous, and have not carious bones for their cauſe. 5 Recent deflections upon the glands of the eye lids 6. All defœdations of the ſkin, from an eryſipelas, to a lepra. 7. Diſeaſes of the glands of the noſe, with their uſual companion a thickneſs of the lip. 8. Obſtructions of the kidneys, where there is no inflammation, and the ſtone not large. 9. In recent obſtructions of the liver this method will be proper, where it prevents conſtipations of the belly, and aſſiſts other medicines directed in icteric caſes. The ſame remedy is ſaid to be of ſignal ſervice in the bronchocele; and is likewiſe recommended for the prevention of thoſe bilious colics that ſo frequently affect our mariners.

To make ſea-water freſh is a thing long and much wanted, for the advantage of navigation and commerce; a method for doing which has been long ago invented by Mr Hauton, and the ſecret publiſhed in the Philoſ. Tranſact. It is performed by precipating the water with oil of tartar, and then diſtilling it. But Mr Appleby's proceſs, which was referred by the lords of the admiralty to the college of phyſicians, and communicated to the royal ſociety, with ſome experiments therewith, on Feb. 8, 1753, appears to be more ſucceſsful, and is performed thus: Into twenty gallons of ſea-water put ſix ounces of a fixed alkali prepared with quick lime as ſtrong as lapis infernalis, and ſix ounces of bones calcined to a whiteneſs, and finely powdered; with a ſlow fire, draw off, in a common ſtill, fifteen gallons. Mr Appleby conceives that the alkali here employed is the beſt adapted to prevent the bituminous matter in ſea-water from riſing by heat in diſtillation.

In the year 1755, a method of procuring any quantity of freſh water at ſea was publiſhed by Dr Butler; together with a method alſo of preſerving freſh water entirely pure, ſweet, and wholeſome, during the longeſt voyage, and in the warmeſt climates. The method more expreſsly recommended by the doctor for making ſea-water freſh is to put a meaſured wine-quart of the ſtrongeſt ſoap leys to fifteen gallons of ſea-water; which being diſtilled, he aſſures us, will generally yield twelve gallons of freſh water. The above quantity of ſoap leys, we are told, will bear a repetition of the ſame quantity of water four or five times.

This method of Dr Butler was tried, by order of the lords of the admiralty, at the ſame time with Mr Appleby's: but the latter, being found to be performed with a leſs quantity of fuel, was preferred.

In order to keep freſh water ſweet, Dr Butler directs to take of fine, clear, white pearl-aſhes, a quarter of a pound avoirdupoiſe, and put into one hundred gallons of freſh water; obſerving this proportion to a greater or leſs quantity,

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quantity, and ſtop up your caſk as uſual, till you have occaſion to broach it.

For the ebbing and flowing of the ſea, ſee ASTRONOMY, p. 473.

SEAMEN, ſuch as are reſerved to ſerve the king, or other perſons, at ſea, who may not depart without licenſe, *&c.* Seamen fighting, quarrelling, or making any diſturbance, may be puniſhed by the commiſſioners of the navy with fine and impriſonment. Regiſtered ſeamen are exempted from ſerving in any pariſh office. *&c.* and are allowed bounty-money beſides their pay. By the law of merchants, the ſea-men of a veſſel are accountable to the maſter or commander, and the maſter to the owners, and the owners to the merchants, for damage ſuſtained either by negligence or otherwiſe. Where a ſeaman is hired for a voyage, and he deſerts it before it is ended, he ſhall loſe his wages; and in caſe a ſhip be loſt by a tempeſt, or in a ſtorm, the ſeamen loſe their wages, as well as the owners their freight.

SEAFORD, a port-town of Suſſex, ſituated on the Engliſh channel, ſeven miles ſouth of Lewes. It ſends two members to parliament.

SEAL, a puncheon, or piece of metal, or other matter, uſually either round or oval, whereon are engraven the arms, device, *&c.* of ſome prince, ſtate, community, magiſtrate or private perſon, often with a legend or ſubſcription, the impreſſion whereof in wax ſerves to make acts, inſtruments, *&c.* authentic.

SEAL is alſo uſed for the wax or lead, and the impreſſion thereon, affixed to the thing ſealed.

SEAL, in Scots law. See LAW, Tit. xii. 25.

SEALER, an officer in chancery appointed by the lord chancellor or keeper of the great ſeal to ſeal the writs and inſtruments there made in his preſence.

SEALING, in architecture, the fixing a piece of wood or iron in a wall with plaſter, mortar, cement, lead, and other ſolid binding. For ſtaples, hinges and joints, plaſter is very proper.

SEALING-WAX. See WAX.

SEAM or SEME *of corn*, is a meaſure of eight buſhels.

SEAM *of glaſs*, the quantity of 120 pound or 24 ſtones, each five pounds weight. The ſeam of wood is an horſe-load.

SEAR CLOTH, or CERE-CLOTH, in ſurgery, a form of external remedy ſomewhat harder than an unguent, yet ſofter than an emplaſter, though it is frequently uſed both for the one and the other. The ſear-cloth is always ſuppoſed to have wax in its compoſition, which diſtinguiſhes and even denominates it. In effect, when a liniment or unguent has wax enough in it, it does not differ from a ſear-cloth.

SEASIN, in a ſhip, the name of a rope by which the boat rides by the ſhip's ſide when in harbour, *&c*

SEASONS, in coſmography, certain portions or quarters of the year, diſtinguiſhed by the ſigns which the earth then enters, or by the meridian altitudes of the ſun, conſequent on which are different temperatures of the air, different works in tillage, *&c.* The year is divided into four ſeaſons: ſpring, ſummer, autumn, and winter. See ASTRONOMY, p. 546.

St. SEBASTIAN, a port-town of Spain, in the province of Biſcay, and territory of Guipuſcoa: ſituated in W. long. 1° 50′, N. lat. 43° 35′.

SECALE, RYE, in botany, a genus of the triandria digynia claſs. The involucrum conſiſts of two leaves, and contains two flowers. There are four ſpecies, only one of them, *viz.* the villoſum, or wood rye-graſs, a native of Britain. For the cerealia, or common rye cultivated in our fields, ſee AGRICULTURE, p. 61.

SECANT, in geometry, is a line that cuts another, or divides it into two parts

SECEDERS, a ſect of Preſbyterians, who diſſented from the eſtabliſhed church of Scotland in the year 1733. The following circumſtance gave riſe to this ſect. Meſſ. Erſkine, Willon Moncrieff and Fiſher, miniſters of the church of Scotland, obſtinately refuſed, for ſeveral years, to obey the deciſions of the General Aſſembly with regard to the ſettlement of miniſters agreeably to the law of patronage: For this open contempt of authority, the Aſſembly, after many and repeated admonitions, were at laſt obliged to eject them from their reſpective charges. Theſe four clergymen, when they ſaw matters carried this length immediately complained of perſecution profeſſed uncommon ſanctity and auſterity of manners; and cried out that the church was over-run with various errors, ſuch as, a compliance with the law of patronage; the tenderneſs of the aſſembly to Profeſſors Simſon and Campbell, who were accuſed of Arian and Arminian hereſies; and a multitude of practical deviations from the covenanted reformation of Scotland: They even inveighed againſt the conduct of the government for their ready admiſſion of malignant and wicked men into places of truſt in the army and ſtate: for the looſe and unlimited reſtoration of Charles II. to the throne; for the reſtoration of prelacy in England, which had been ſolemnly abjured; for reſtoring the ſuperſtitious Chriſtmas vacance; for the repeal of the penal laws againſt *witches*, *&c. &c.* Theſe things, joined to the popular talents of ſome of the above miniſters, alarmed the minds of many well-meaning people, and in a few years procured a numerous train of followers. Elated with this unexpected ſucceſs, they ſoon ſplit into two parties. The chief point of conteſt among the leaders of this ſect was concerning the lawfulneſs of what is called the burgeſs-oath; and hence the one party have ever ſince been called *Burghers*, and the other *Antiburghers*. This diviſion naturally weakened their cauſe and diminiſhed their number, which ſtill ſeems to be upon the decline.

SECOMIÆ, in natural hiſtory, the name of a genus of foſſils, of the claſs of the ſeptariæ, the characters of which are; that they are bodies of a duſky hue, divided by ſepta, or partitions of a ſparry matter, into ſeveral more or leſs regular portions, of a moderately firm texture, not giving fire with ſteel, but fermenting with acid menſtrua and eaſily calcining.

The ſeptariæ of this genus are, of all others, the moſt common, and are what have been known by the little expreſſive, or miſtaken names of the waxen vein, or ludus helmontii. We have many ſpecies of theſe bodies common among us Of the whitiſh or browniſh kinds we have thirteen; of the yelloviſh five; and of the ferrugineous ones, four.

SECOND, in geometry, chronology, *&c.* the ſixtieth part of a prime or minute, whether of a degree, or of an hour.

SECOND, in muſick, one of the muſical intervals; being only the difference between any ſound and the next neareſt ſound, whether above or below it.

SECON-

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SECONDARY, in general, ſomething that acts as ſecond, or in ſubordination to another.

SECRETARY, an officer who by his maſter's orders writes letters, diſpatches, and other inſtruments, which he renders authentic by his ſignet. Of theſe there are ſeveral kinds; as, 1. Secretaries of ſtate, who are officers that have under their management and direction the moſt important affairs of the kingdom, and are obliged conſtantly to attend on the king: they receive and diſpatch whatever comes to their hands, either from the crown, the church, the army, private grants, pardons, diſpenſations, &c. as likewiſe petitions to the ſovereign; which when read, are returned to them; all which they diſpatch according to the king's direction. They have authority to commit perſons for treaſon, and other offences againſt the ſtate, as conſervators of the peace at common law, or as juſtices of the peace throughout the kingdom. They are members of the privy-council, which is ſeldom or never held without one of them being preſent: and as to the buſineſs and correſpondence in all parts of this kingdom, it is managed by either of the ſecretaries without any diſtinction: but with reſpect to foreign affairs, the buſineſs is divided into two provinces, or departments, the ſouthern and the northern, comprehending all the kingdoms and ſtates that have any intercourſe with Great Britain; each ſecretary receiving all letters and addreſſes from, and making all diſpatches to, the ſeveral princes and ſtates comprehended in his province. Ireland and the Plantations are under the direction of the elder ſecretary, who has the ſouthern province, which alſo comprehends France, Italy, Switzerland, Spain, Portugal, and Turky: the northern province includes the Low Countries, Germany, Denmark, Sweden, Poland, and Muſcovy. Each of the ſecretaries have an apartment in all the royal houſes, both for their own accommodation and their officers; they have alſo a table at the king's charge, or elſe board-wages. The two ſecretaries of ſtate have each two under ſecretaries, and one chief clerk, with an uncertain number of other clerks and tranſlators, all wholly depending on them. To the ſecretaries of ſtate belong the cuſtody of that ſeal properly called the ſignet, and the direction of two other offices, one called the paper-office, and the other the ſignet office. 2. Secretary of an embaſſy, a perſon attending an ambaſſador for writing diſpatches relating to the negociation. There is a great difference between the ſecretary of an embaſſy, and the ambaſſador's ſecretary; the laſt being a domeſtic or menial of the ambaſſador, and the firſt a ſervant or miniſter of the prince. 3. The ſecretary of war, an officer of the war-office, who has two chief clerks under him, the laſt of which is the ſecretary's meſſenger. There are alſo ſecretaries in moſt of the other offices.

SECRETION, the ſeparation of ſome fluid from the blood by means of the glands.

In the bodies of animals we obſerve a great number of juices of different natures, *viz.* the blood, lympha, ſaliva, ſtomach liquor, inteſtinal juices, pancreatic juice, bile, urine, &c. and the blood is the general ſource of all. See BLOOD, LYMPH, SALIVA, &c.

SECT, a collective term, comprehending all ſuch as follow the doctrines and opinions of ſome famous divine, philoſopher, &c.

SECTION in general, denotes a part of a divided thing, or the diviſion itſelf. Such, particularly, are the ſubdiviſions of a chapter; called alſo paragraphs and articles: the mark of a ſection is §.

SECTION, in geometry denotes a ſide or ſurface appearing of a body or figure cut by another; or the place where lines, planes, &c. cut each other.

SECTOR, in geometry, is a part of a circle comprehended between two radii and the arch; or it is a mixed triangle, formed by two radii and the arch of a circle.

SECTOR is alſo a mathematical inſtrument, of great uſe in finding the proportion between quantities of the ſame kind, as between lines and lines, ſurfaces and ſurfaces, &c. for which reaſon the French call it the compaſs of proportion.

The great advantage of the ſector above common ſcale, &c. is, that it is adapted to all radii, and all ſcales. For, by the line of chords, ſines, tangents, &c. on the ſector, we have lines of chords, ſines, tangents, &c. adapted to any radius betwixt the length and breadth of the ſector, when opened.

The ſector is founded on the fourth propoſition of the ſixth book of Euclid, where it is demonſtrated, that ſimilar triangles have their homologous ſides proportional.

SECULAR, ſomething that is temporal; in which ſenſe, the word ſtands oppoſed to eccleſiaſtical: thus we ſay, ſecular power, ſecular juriſdiction, &c.

SECULAR GAMES, *ludi ſeculares*, in antiquity, ſolemn games held among the Romans once in an age. Theſe games laſted three days and as many nights, during which time ſacrifices were performed, theatrical ſhews exhibited, with combats, ſports, &c. in the circus. The occaſion of theſe games, according to Valerius Maximus, was to ſtop the progreſs of a plague. The firſt who had them celebrated at Rome was Valerius Publicola, the firſt conſul created after the expulſion of the kings. The ceremonies to be obſerved therein were found preſcribed in one of the books of the Sibyls. At the time of the celebration of the ſecular games, heralds were ſent throughout all the empire, to intimate that every one might come and ſee thoſe ſolemnities which he never yet had ſeen, nor was ever to ſee again. Authors are not agreed as to the number of years wherein theſe games returned, partly becauſe the quantity of an age or ſeculum among the ancients is not known, and partly on other accounts; ſome will have it that they were held every hundred years, and that the ſeculum or age was our century.

SECULARIZATION, the act of converting a regular perſon, place, or benefice, into a ſecular one.

SECUNDINES, in anatomy, the ſeveral coats or membranes wherein the fœtus is wrapped up in the mother's womb, as the chorion and amnios, with the placenta, &c. See MIDWIFERY.

SECURIDACA, in botany, a genus of the diadelphia decandria claſs. The calix conſiſts of three leaves; the corolla is papilionaceous, with a vexillum; and the pod is oval, and contains one ſeed. There are two ſpecies, both natives of America.

SECUTORES, in antiquity, a kind of gladiators among the Romans, who fought againſt the retiarii. The ſecutores were armed with a ſword and a buckler, to keep off the net or nooſe of their antagoniſts, and they wore a caſk on their head.

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This was alſo a name given to ſuch gladiators as took the place of thoſe killed in the combat, or who fought the conqueror.

SEDAN, a town of Champagne, in France, ſituated on the river Maes: in E. long. 4° 45′, N. lat 49° 46′.

Act of SEDERUNT, in Scots law. See LAW, Tit. i. 4.

SEDIMENT, the ſettlement or dregs of any thing, or that groſs heavy part of a fluid body which, upon reſting, ſinks to the bottom of the veſſel.

SEDITION, in Scots law. See LAW, Tit. xxxiii. 13.

SEDR, or SEDRE, the high prieſt of the ſect of Ali among the Perſians. The ſedr is appointed by the emperor of Perſia, who uſually confers the dignity on his neareſt relation. The juriſdiction of the ſedr extends over all effects deſtined for pious purpoſes, over all moſques, hoſpitals, colleges, ſepulchres, and monaſteries. He diſpoſes of all eccleſiaſtical employments, and nominates all the ſuperiors of religious houſes. His deciſions in matters of religion are received as ſo many infallible oracles; he judges of all criminal matters in his own houſe without appeal. His authority is balanced by that of the mudſitehid, or firſt theologue of the empire.

SEDUM, in botany, a genus of the decandria pentagynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; it has five nectariferous ſcales at the baſe of the germen, and five capſules. There are 19 ſpecies, nine of them natives of Britain, all orpines and houſe-leeks

SEED, in phyſiology, a ſubſtance prepared by nature for the reproduction and conſervation of the ſpecies both in animals and plants. See GENERATION, and AGRICULTURE, p. 40

SEEDLINGS, among gardeners, denote ſuch roots of gilliflowers, &c. as come from ſeed ſown. Alſo the young tender ſhoots of any plants that are newly ſown.

SEEDY, in the brandy trade, a term uſed by the dealers, to denote a fault that is found in ſeveral parcels of French brandy, which renders them unſaleable. The French ſuppoſe that theſe brandies obtain the flavour which they expreſs by this name from weeds that grow among the vines from whence the wine of which this brandy is made was preſſed,

SEEING, the act of perceiving objects by the organ of ſight; or it is the ſenſe we have of external objects by means of the eye. See OPTICS.

SEELING, in the manege. A horſe is ſaid to ſeel when he begins to have white eye-brows, that is, when there grows on that part about the breadth of a farthing of white hairs, mixed with thoſe of his natural colour, which is a mark of old age. It is ſaid, that a horſe never ſeels till he is fourteen years old, and always does before he is ſixteen years.

SEELING, at ſea, is uſed in the ſame ſenſe nearly with heeling: when a ſhip lies down conſtantly, or ſteadily on one ſide, the ſeamen ſay ſhe heels; and they call it ſeeling when ſhe tumbles violently and ſuddenly, by reaſon of the ſea forſaking her, as they call it, that is, the waves leaving her for a time in a bowling ſea.

SEGEDIN, a city of Upper Hungary, ſituated on the river Tevſſe, in E. long. 21°, N. lat. 46° 21′.

SEGESWAEE, a city of Tranſylvania, ſituated E. lon. 24°, N. lat. 47° 25′.

SEGMENT *of a circle*, in geometry, that part of the circle contained between a chord and an arch of the ſame circle.

SEGOVIA, a city of Manila, the largeſt of the Philippine iſlands, ſituated in E. long. 119°, N. lat. 18° 30′.

This is alſo a name of a city of Spain, in the province of Old Caſtile, ſituated W. long. 4° 35′, N. lat. 41°.

SEGRA, a river of Spain, which riſing in the north of Catalonia, and running ſouth-weſt, diſcharges itſelf into the Ebro, at Miquinenca.

SEGREANT, is the herald's word for a griffon, when drawn in a leaping poſture, and diſplaying his wings as if ready to fly.

SEGUE, in the Italian muſick, is often found before *aria*, *alleluja*, *amen*, &c. to ſhew that thoſe portions or parts are to be ſung immediately after the laſt note of that part over which it is writ; but if theſe words *ſi piace*, or *ad libitum*, are joined therewith, it ſignifies, that theſe portions may be ſung or not, at pleaſure.

SEGURA, a town of Portugal, in the province of Beira, ten miles north-weſt of Alcantara. This is alſo the name of a town in Spain, in the province of New Caſtile, and territory of La Mancha, ſituated among the mountains of Segura; W. long. 2° 50′, N. lat. 38° 25′.

SEJANT, a term uſed in heraldry, when a lion, or other beaſt, is drawn, in an eſcutcheon, ſitting like a cat, with his fore feet ſtrait.

SEIZURE, in commerce, an arreſt of ſome merchandize, moveable, or other matter, either in conſequence of ſome law, or of ſome expreſs order of the ſovereign.

SEISIN, in Scots law. See LAW, Tit. x. 16.

SELAGO, in botany, a genus of the didynamia angioſpermia claſs of plants. The calix has five ſegments; the tube of the corolla is capillary; and there is but one ſeed. The ſpecies are eight, none of them natives of Britain.

SELBY, a town of Yorkſhire, ſituated ten miles ſouth of York.

SELENDERS, in the manege, are chops, or mangy ſores, in the bending of a horſe's hough, as the malenders are in the knees. See FARRIERY.

SELENITÆ, MOON-STONE, in natural hiſtory, a claſs of foſſils, naturally and eſſentially ſimple; not inflammable nor ſoluble in water; compoſed of ſlender filaments, ranged into fine and even thin flakes, and thoſe diſpoſed into regular figures, in the different genera, approaching to a rhomboide, a hexangular column, or a rectangled inequilateral parallelogram; fiſſile like the talcs, but that not only horizontally, but perpendicularly alſo; flexile in a ſmall degree, but not at all elaſtic; not fermenting with acid menſtrua, and readily calcining in the fire.

SELENOGRAPHY, a branch of coſmography, which deſcribes the moon and all the parts and appearances thereof, as geography does thoſe of the earth

SELEUCIDÆ, in chronology. Æra of the Seleucidæ, or the Syro-macedonian æra, is a computation of time commencing from the eſtabliſhment of the Seleucidæ, a race of Greek kings, who reigned as ſucceſſors of Alexander the Great in Syria, as the Ptolomies did in Egypt. This æra we find expreſſed in the book of the Maccabees, and on a great number of Greek medals ſtruck by the cities of Syria, &c. The Rabbins call it the æra of contracts; and the Arabs, Therik dilkarnain, that is, the æra of the two horns. According to the beſt accounts, the firſt

year

year of this æra falls in the year 311 before Chriſt, being twelve years after Alexander's death.

SELINGENSKOY, a town of Aſiatic Muſcovy, in the province of Siberia, ſituated on the road from Toboliſki to China, on the river Selinga: in E. long. 65°, N. lat. 50°.

SELINUM, in botany, a genus of the pentandria digynia claſs. The fruit is ſomewhat oval, and ſtriated in the middle; the involucrum is reflected; and the petals are equal and cordated. There are four ſpecies, none of them natives of Britain.

SELKIRK, a borough town of Scotland, in the county of Tweedale, ſituated 32 miles ſouth of Edinburgh.

SELLA TURCICA. See ANATOMY, p. 149.

SELTZER WATER, the name of a mineral water of Germany, which ariſes near Neider Selts, and is now uſed in England and many other countries. We call it ſeltz, or ſaltzer water; and the phyſicians preſcribe it in many caſes, as ſcurvies, ſpaſmodic affections, and in conſumptions; in the laſt caſe, mixing it with aſſes milk.

SEMIOTICA, that part of medicine which conſiders the ſigns or indications of health and diſeaſes, and enables the phyſician to judge what is, was, or will be, the ſtate, degree, order, and effect, of health or ſickneſs.

SEMENDRIA, a town of European Turky, in the province of Servia, ſituated on the Danube, thirty miles ſouth-eaſt of Belgrade.

SEMENTINEÆ FERIÆ, in antiquity, feaſts held annually among the Romans, to obtain of the gods a plentiful harveſt. They were celebrated in the temple of Tellus, where ſolemn ſacrifices were offered to Tellus and Ceres. Theſe feaſts were held about ſeed-time, uſually in the month of January; for Macrobius obſerves, they were moveable feaſts.

SEMI, a word borrowed from the Latin, ſignifying *half*, but only uſed in compoſition with other words, as in the following articles.

SEMI-CIRCLE, in geometry, half a circle, or that figure comprehended between the diameter of a circle and half the circumference.

SEMI-COLON, in grammar, one of the points or ſtops uſed to diſtinguiſh the ſeveral members of ſentences from each other. See PUNCTUATION.

The mark or character of the ſemi-colon is (;) and has its name as being ſomewhat of leſs effect than a colon, or as demanding a ſhorter pauſe.

SEMI-CUPIUM, in medicine, an half bath, wherein the patient is only placed up to the navel.

SEMI-DIAMETER, half the diameter, or a right line drawn from the centre of a circle, or ſphere, to its circumference; being the ſame with what is otherwiſe called the radius.

SEMIFLOSCULUS, in botany, a term uſed to expreſs the flowers of the ſyngeneſia claſs. Theſe ſemifloſculus are petals, hollow in their lower part, but in their upper flat, and continued in the ſhape of a tongue.

SEMIGALIA, the eaſtern diviſion of the duchy of Courlandin Poland

SEMI-INTEROSSEUS INDICIS, in anatomy. See ANATOMY, p 201.

SEMI LUNAR VALVES, in anatomy. See ANATOMY, p. 178.

SEMI-MEMBRANOSUS, in anatomy. See ANATOMY, p. 208.

SEMI-PELAGIANS, in church-hiſtory, a branch of the Pelagians, ſo called becauſe they pretended to keep a medium between the Pelagians and the orthodox.

SEMI TONE, in muſick, one of the degrees or concinnous intervals of concords.

SEMINAL, ſomething belonging to the ſemen or ſeed.

SEMINARY, a kind of college, or ſchool, where youth are inſtructed in the ceremonies, *&c.* of the ſacred miniſtry, of which there are many abroad; it being ordained by the council of Trent, that there be a ſeminary belonging to each cathedral, under the direction of the biſhop.

SEMINATION, denotes the manner, or act, of ſhedding and diſperſing the ſeeds of plants. See AGRICULTURE, p. 59

SEMI-NERVOSUS, in anatomy. See ANATOMY, p. 208.

SEMIS, in Roman antiquity, the half of an *as*. See AS.

SEMI-SPINALIS, in anatomy. See ANATOMY, p. 218.

SEMPERVIVUM, in botany, a genus of the dodecandria dodecagynia claſs. The calix conſiſts of twelve ſegments, and the corolla of twelve petals; and there are twelve capſules containing many ſeeds.

SENA, in botany. See CASSIA.

Sena leaves are much uſed for their purgative virtue; but are apt to gripe, unleſs given with proper correctives, as coriander, aniſeed, ginger, raiſins, and ſalt of tartar, which are added to the infuſion of the leaves occaſionally.

SENATE, in general, is an aſſembly, or council, of ſenators; that is, of the principal inhabitants of a ſtate, who have a ſhare in the government.

The ſenate of ancient Rome is, of all others, the moſt celebrated: it exerciſed no contentious juriſdiction, but appointed judges, either from among the ſenators or knights, to determine proceſſes: it alſo appointed governors of provinces, and diſpoſed of the revenues of the commonwealth, *&c.* Yet did not the whole ſovereign power reſide in the ſenate, ſince it could not elect magiſtrates, make laws, or decide of war or peace; in all which caſes the ſenate was obliged to conſult the people.

According to Dr Middleton, the conſtant and regular ſupply of the ſenate was from the annual magiſtrates; who, by virtue of their ſeveral offices, acquired a right to ſit and vote in that aſſembly: the uſual gradation of theſe offices being that of quæſtor, tribune of the people, ædile, prætor, and conſul.

The ſenate always met of courſe on the firſt of January, for the inauguration of the new conſuls; and in all months univerſally, there were three days, *viz.* the kalends, nones, and ides, on which it regularly met: but it always met on extraordinary occaſions, when called together by conſul, tribune, or dictator.

SENATOR, in general, denotes a member of ſome ſenate.

SENATUS AUCTORITAS, a vote of the Roman ſenate, drawn up in the ſame form with a decree, but without its force, as having been hindered from paſſing into a decree by ſome of the tribunes of the people.

SENATUS-CONSULTUM, a decree of the Roman ſenate, pronounced on ſome queſtion or point of law; which, when paſſed, made a part of the Roman law.

SENECIO, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is naked; the pappus is ſimple; and the calix is cylindrical, and caliculated. There are 40 ſpecies, eight of them natives of Britain.

SENEGA, or SENEGAL, a river of Negroland, in Africa, which

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which falls into the Atlantic ocean, in 16° N. lat. whence the gum-ſenega is imported.

SENESCHAL, a term anciently uſed for ſteward or major-domo.

SENS, a town of Champagne, in France, ſituated on the river Yonne, ſixty miles ſouth-eaſt of Paris.

SENSATION, in philoſophy, the act of perceiving external objects, by means of the ſenſes.

SENSE, a faculty of the ſoul, whereby it perceives external objects, by means of the impreſſions they make on certain organs of the body. Theſe organs of ſenſation are commonly reckoned five, *viz.* the eye, whereby we ſee objects; the ear, which enables us to hear ſounds; the noſe, by which we receive the ideas of different ſmells; the palate, by which we judge of taſtes; and the cutis, or ſkin, which enables us to feel the different forms, hardneſs, or ſoftneſs of bodies. See ANATOMY, p 289, 293. 295. 303; OPTICS, *paſſim*; and PNEUMATICS.

SENSITIVE PLANT, in botany. See MIMOSA.

SENSORIUM COMMUNE, the ſame with the brain. See ANATOMY, p. 285.

SENTENCE, in Scots law. See LAW, Tit. xxxii 1, *&c.*

SENTENCE, in grammar, a period or ſet of words, comprehending ſome perfect ſenſe or ſentiment of the mind.

SENTIMENTS, properly ſignifies the feelings excited in our minds by means of the ſenſes.

SENTINEL, in military affairs, is a private ſoldier, placed in ſome poſt, to watch any approach of the enemy, to prevent ſurpriſes, and to ſtop ſuch as would paſs without order, or diſcovering who they are.

SEPARATION *of Huſband and Wife*, in Scots law. See LAW, Tit. vi. 13.

SEPARATISTS, an appellation given to diſſenters, from their ſetting up a ſeparate church from the eſtabliſhed one.

SEPIA, in zoology, a genus belonging to the order of vermes molluſca. There are eight brachia interſperſed on the interior ſide, with little, round, ſerrated cups, by the contraction of which the animal lays faſt hold of any thing: Beſides theſe eight arms, it has two tentacula longer than the arms, and frequently pedunculated. The mouth is ſituate in the centre of the arms; and is horny and hooked, like the bill of a hawk. The eyes are below the tentacula, towards the body of the animal. The body is fleſhy, and received into a ſheath as far as the breaſt. There are five ſpecies. The officinalis, or cuttle-fiſh, emits a black matter when attacked, which hides it from the view of the enemy. The loligo, has a ſubulated cylindrical body, with a rhomboidal tail. It is ſometimes found on the coaſts of the frith of Forth, eſpecially after great ſtorms. The other ſpecies are moſtly found in the Mediterranean ſea.

SEPS, in zoology. See LACERTA.

SEPTARIÆ, in natural hiſtory, a large claſs of foſſils, commonly known by the names of ludus Helmontii and waxen veins.

They are defined to be foſſils not inflammable, nor ſoluble in water; of a moderately firm texture, and duſky hue, divided by ſeveral ſepta or thin partitions, and compoſed of a ſparry matter greatly debaſed by earth, not giving fire with ſteel, fermenting with acids, and in great part diſſolved by them, and calcining in a moderate fire.

Of this claſs there are two diſtinct orders of bodies; and under thoſe, ſix genera. The ſeptariæ of the firſt order are thoſe which are uſually found in large maſſes, of a ſimple uniform conſtruction, but divided by large ſepta either into larger and more irregular portions, or into ſmaller and more equal ones, called talc. The genera of this order are four: 1. Thoſe divided by ſepta of ſpar, called ſecomæ. 2 Thoſe divided by ſepta of earthy matter, called gaiophragmia. 3 Thoſe divided by ſepta of the matter of the pyrites, called pyritercia. And, 4. Thoſe divided by ſepta of ſpar, with an admixture of cryſtal, called diaugophragmia.

Thoſe of the ſecond order are ſuch as are uſually found in ſmaller maſſes, of a cruſtated ſtructure, formed by various incruſtations round a central nucleus, and divided by very thin ſepta. Of this order are only two genera: 1. Theſe with a ſhort roundiſh nucleus, incloſed within the body of the maſs; And, 2. Thoſe with a long nucleus, ſtanding out beyond the ends of the maſs.

SEPTEMBER, the ninth month of the year, conſiſting of only thirty days: it took its name as being the ſeventh month, reckoning from March, with which the Romans began their year.

SEPTENTRIO, in aſtronomy, a conſtellation more uſually called urſa minor.

In coſmography, the term ſeptentrio denotes the ſame with north: and hence, ſeptentrional is applied to any thing belonging to the north, as ſeptentrional ſigns, parallels, *&c.*

SEPTIZON, in Roman antiquity, a celebrated mauſoleum, built by Septimus Severus, in the tenth region of the city of Rome: it was ſo called from *ſeptem* and *zona*, by reaſon it conſiſted of ſeven ſtories, each of which was ſurrounded by a row of columns.

SEPTUAGESIMA, in the calendar, denotes the third Sunday before Lent, or before quadrageſima Sunday; ſuppoſed by ſome to take its name from its being about ſeventy days before Eaſter.

SEPTUAGINT, the name given to a Greek verſion of the books of the Old Teſtament. See BIBLE.

SEPTUM, in anatomy, an incloſure, or partition, a term applied to ſeveral parts of the body which ſerve to ſeparate one part from another

SEPULCHRE, a tomb, or place deſtined for the interment of the dead. This term is chiefly uſed in ſpeaking of the burying places of the ancients, thoſe of the moderns being uſually called tombs.

Sepulchres were held ſacred and inviolable, and the care taken of them has always been held a religious duty, grounded on the fear of God, and the belief of the ſoul's immortality. Thoſe who have ſearched or violated them have been thought odious by all nations, and were always ſeverely puniſhed.

The Egyptians called ſepulchres, eternal houſes; in contradiſtinction to their ordinary houſes or palaces, which they called inns, on account of their ſhort ſtay in the one, in compariſon of their long abode in the other.

Regular canons of St SEPULCHRE, a religious order, formerly inſtituted at Jeruſalem, in honour to the holy ſepulchre, or the tomb of Jeſus Chriſt.

Many of theſe canons were brought from the Holy Land into Europe, particularly into France by Lewis the younger; into Poland, by Jaxa a Poliſh gentleman; and into

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into Flanders, by the counts thereof; many alſo came into England. This order was however ſuppreſſed by pope Innocent VIII who gave its revenues and effects to that of our Lady of Bethlehem; which alſo becoming extinct, they were beſtowed on the knights of St John of Jeruſalem. But the ſuppreſſion did not take effect in Poland, where they ſtill ſubſiſt, as alſo in ſeveral provinces of Germany. Theſe canons follow the rule of St. Auguſtine.

Knights of the holy SEPULCHRE, a military order, eſtabliſhed in Paleſtine about the year 1114.

The knights of this order in Flanders choſe Philip II. king of Spain, for their maſter in 1558, and afterwards his ſon; but the grand maſter of the order of Malta prevailed on the laſt to reſign: and when afterwards the duke of Nevers aſſumed the ſame quality in France, the ſame grand maſter, by his intereſt and credit, procured a like renunciation of him, and a confirmation of the union of this order to that of Malta.

SEQUELS. in Scots law. See LAW, Tit. xvi. 12.

SEQUESTRATION, in Scots law. See LAW, Tit. xix. 10 and xx. 12

SEQUIN, a gold coin, ſtruck at Venice, and in ſeveral parts of the grand ſeignor's dominions.

SERAGLIO, a Perſian word, which ſignifies the palace of a prince or lord; in which ſenſe the houſes of the ambaſſadors of England, France, *&c* are, at Conſtantinople, called their ſeraglios. But the term ſeraglio is uſed by way of eminence, for the palace of the grand ſeignor at Conſtantinople, where he keeps his court, in which his concubines are lodged, and where the youth are trained up for the principal poſts of the empire. It is in form of a triangle, about two miles round, at the end of the promontory Chryſoceras, now called the Seraglio-point: the buildings extend to the top of the hill, and from thence there are gardens that reach to the ſea. The outward appearance is not very beautiful, the architecture being irregular, conſiſting of ſeparate edifices, in the manner of pavilions and domes. The old ſeraglio is the palace where the grand ſeignor's old miſtreſſes are kept.

The ladies of the haram, which is the part allotted to the women, is a collection of young beautiful girls, who, on their admiſſion, are committed to the charge of ſome old lady, and taught muſick, dancing, and other accompliſhments. Theſe frequently play and dance before the grand ſeignor, while others entertain him with their converſation. Beſides theſe ladies, there are a great many black eunuchs, and female ſlaves, in the ſeraglio, whoſe buſineſs it is to guard and wait upon them.

SERAPH, or SERAPHIM, a ſpirit of the higheſt rank in the hierarchy of angels; who are thus called from their being ſuppoſed to be moſt inflamed with divine love, by their nearer and more immediate attendance at the throne of God, and to communicate their fervour to the remoter and inferior orders.

SERAPHIC, burning or inflamed with love or zeal, like a ſeraphim: thus St. Bonaventure is called the ſeraphic doctor, from his abundant zeal and fervour.

SERAPIAS in botany, a genus of the gynandria diandria claſs. The nectarium is oval and gibbous, with an oval lip. There are five ſpecies, two of them natives of Britain, *viz.* the latifolia, or broad-leaved baſtard hellebore; and the lingifolia, or white-flowered baſtard hellebore.

SERENADE, a kind of concert given in the night, by a lover to his miſtreſs, under her window. Theſe ſometimes only conſiſt of inſtrumental muſick, but at other times voices are added: the muſick and ſong compoſed for theſe occaſions are alſo called ſerenades.

SERENE, a title of honour given to ſeveral princes, and to the principal magiſtrates of republics. The king of England, the republic and the doge of Venice, and the children of the king of Spain, are called Moſt Serene: and when the pope, or the ſacred college, write to the emperor, to kings, or the doge, they give them no other title: in like manner the emperor gives no other title to any king, except to the king of France.

SERGE, a woolen ſtuff manufactured in a loom, of which there are various kinds, denominated either from their different qualities, or from the places where they are wrought; the moſt conſiderable of which is the London ſerge, which is highly valued abroad, and of which a manufacture has been for ſome years carried on in France.

SERGEANT, or SERJEANT *at law*, or *of the coif*, is the higheſt degree taken at the common law, as that of doctor is of the civil law; and as theſe are ſuppoſed to be moſt learned and experienced in the practice of the courts, there is one court appointed for them to plead in by themſelves, which is the common-pleas, where the common law of England is moſt ſtrictly obſerved: but they are not reſtrained from pleading in any other court, where the judges, who cannot have that honour till they have taken the degree of ſerjeant at law call them brothers.

SERGEANT *at arms*, or *mace*, an officer appointed to attend the perſon of the king; to arreſt traitors, and ſuch perſons of quality as offend; and to attend the lord high ſteward when ſitting in judgment on a traitor.

The number of theſe officers is by ſtatute limited to that of thirty.

SERGEANT, in war, is an inferior officer in a company of foot, or troop of dragoons, armed with an halbard, and appointed to ſee diſcipline obſerved, to teach the ſoldiers the exerciſe of their arms, and to order, ſtraiten, and form ranks, files, *&c*.

SERICUM. See SILK.

SERIES, in general, denotes a continued ſucceſſion of things in the ſame order, and having the ſame relation or connection with each other: in this ſenſe we ſay, a ſeries of emperors, kings, biſhops, *&c*.

SERIES, in mathematicks, is a number of terms, whether of numbers or quantities, increaſing or decreaſing in a given proportion See ALGEBRA p. 88

SERIPHIUM, in botany, a genus of the ſyngeneſia monogynia claſs. The calix is imbricated; the corolla conſiſts of one irregular petal; and there is a ſingle oblong ſeed below the corolla. There are three ſpecies, none of them natives of Britain.

SEROSITY, in medicine, denotes an over-abundance of ſerum.

SERPA, a town of Portugal, in the province of Alentejo, ſituated on the eaſt-ſide of the river Guadiana, in W. long. 8° 20′, N. lat 37° 45′.

SERPENS, in aſtronomy. See ASTRONOMY, p. 487.

SERPENT, in zoology. See COLUBER, BOA, ANGUIS, CÆCILIA, AMPHISBÆNA, CROTALUS.

SERPENTARIA, SNAKE ROOT, the name of a ſpecies of ariſtolochia, or birthwort, with auriculated leaves.

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The Virginian ſnake-root obtained its name, as being accounted a ſpecific againſt venomous bites: but whatever truth there may be in that, it is undoubtedly an excellent diuretic, diaphoretic, and alexipharmic medicine, and conſequently good in inflammatory and malignant fevers: it is alſo a powerful antiſeptic, and its doſe is from four to ten or fifteen grains in powder.

SERPENTARIUS, in aſtronomy. See ASTRONOMY, p. 487.

SERPENTINE, in general, denotes any thing that reſembles a ſerpent: hence, the worm or pipe of a ſtill, twiſted in a ſpiral manner, is termed a ſerpentine worm.

SERRATED, in general, ſomething indented, or notched, in the manner of a ſaw; a term much uſed in the deſcription of the leaves of plants.

SERRATULA, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The calix is ſomewhat cylindrical, imbricated, and blunt. There are 16 ſpecies three of them natives of Britain, *viz* the tinctoria, or ſaw-wort; the alpina, or mountain ſaw-wort; and the arvenſis, or corn ſaw-wort.

SERRATUS, in anatomy, a name given to ſeveral muſcles, from their reſemblance to a ſaw. See ANATOMY, Part II.

SERVANT, a term or relation ſignifying a perſon who owes and pays a limited obedience for a certain time, to another in quality of maſter. See LAW, Tit. vii. 34.

SERVETISTS, a name given to the modern antitrinitarians, from their being ſuppoſed to be the followers of Michael Servetus, who, in the year 1599, was burnt at Geneva, together with his books.

SERVIA, a province of European Turky, bounded by the Save and the Danube, on the north; by Bulgaria, on the eaſt; by Albinia and Macedon, on the ſouth; and by Boſnia and Dalmatia, on the weſt.

SERVICE OF HEIRS, in Scots law. See LAW, Tit. xxvii. 22, *&c.*

SERVITES, a religious order in the church of Rome, founded about the year 1233, by ſeven Florentine merchants, who, with the approbation of the biſhop of Florence, renounced the world, and lived together in a religious community on mount Senar, two leagues from that city.

SERVITOR, in the univerſity of Oxford, a ſtudent who attends on another for his maintenance and learning.

SERVITUDE, in Scots law. See LAW, Tit. xvi. 1, *&c.*

SERUM, a thin, tranſparent, ſaltiſh liquor, which makes a conſiderable part in the maſs of blood. See BLOOD.

SESAMOIDA OSSA, in anatomy. See ANATOMY, p. 188.

SESAMUM, in botany, a genus of the didynamia angioſpermia claſs. The calix conſiſts of five ſegments; the corolla is campanulated, with five ſegments; the ſtigma is lanceolated; and the capſule has four cells. There are two ſpecies, both natives of India.

The ſeeds of this plant, upon expreſſion, yield a larger quantity of oil than almoſt any other known vegetable; among the Indians, they are uſed as food.

SESELI, in botany, a genus of the pentandria digynia claſs. The umbellæ are globular; the involucrum conſiſts of many leaves; and the fruit is oval and ſtriated. There are 13 ſpecies, only one of them, *viz*, the caruifolia, or meadow-ſaxifrage, a native of Britain.

SESQUI, a Latin particle, ſignifying a whole and a half, which joined with *altera*, *terna*, *quarta*, &c. is much uſed in the Italian muſick to expreſs a kind of ratios, particularly ſeveral pieces of triples.

SESSILE, among botaniſts. See BOTANY, p. 541.

SESSION, in general, denotes each ſitting or aſſembly of a council, *&c.*

SESSION *of parliament*, is the ſeaſon or ſpace from its meeting to its prorogation.

Court of SESSION, in Scots law. See LAW, Tit. iii. 4.

SESTERCE, a ſilver coin in uſe among the Romans.

Some authors make two kinds of ſeſterces, the leſs called ſeſtertius, in the maſculine gender; and the great one, called ſeſtertium, in the neuter; the latter containing a thouſand of the other.

Others will have any ſuch diſtinction of great and little ſeſterces unknown to the Romans: Seſtertius, ſay they, was an adjective, and ſignified *as ſeſtertius*, or two aſſes and an half; and when uſed plurally, as in quinquaginta ſeſtertium, ſeſtertia, it was only by way of abbrevation, and there was always underſtood millia, or thouſand.

SESTOS, a noted fortreſs of European Turky, ſituated at the entrance of the Helleſpont or Dardanelles, twenty-four miles ſouth-weſt of Gallipoli.

SET, or SETS, a term uſed by the farmers and gardeners to expreſs the young plants of the white thorn and other ſhrubs, with which they uſe to raiſe their quick or quick-ſet hedge.

SETHIANS, in church-hiſtory, chriſtian heretics, ſo called becauſe they paid divine worſhip to Seth, whom they looked upon to be Jeſus Chriſt the ſon of God, but who was made by a third divinity, and ſubſtituted in the room of the two families of Abel and Cain, which had been deſtroyed by the deluge. Theſe heretics appeared in Egypt in the ſecond century; and as they were addicted to all ſorts of debauchery, they did not want for followers, and continued in Egypt about two hundred years.

SETON, in ſurgery, a few horſe-hairs, ſmall threads, or large packthread, drawn through the ſkin, chiefly the neck, by means of a large needle or probe, with a view to reſtore or preſerve health by a diſcharge of matter.

SETTE, a veſſel very common in the Mediterranean, with one deck, and a very long and ſharp prow; they carry ſome two maſts, ſome three, without topmaſts. Their yard and ſails are all like the mizen; the leaſt of them are of ſixty tons burden: they ſerve to tranſport cannon and proviſion for ſhips of war and the like.

SETTING, in aſtronomy, the withdrawing a ſtar or planet, or its ſinking below the horizon.

SETTING, in the ſea language. To ſet the land or the ſun by the compaſs, is to obſerve how the land bears on any point of the compaſs, or on what point of the compaſs the ſun is. Alſo when two ſhips ſail in ſight of one another, to mark on what point the chaced bears, is termed ſetting the chace by the compaſs.

SETTING, among ſportſmen, a term uſed to expreſs the manner of taking partridges by means of a dog peculiarly trained to that purpoſe.

SETTLE, a market-town of the weſt riding of Yorkſhire, ſituated forty-five miles weſt of York.

SEVENTH, in muſick, an interval called by the Greeks heptachordon. See MUSICK.

SEVE-

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SEVERANCE, in law, the ſingling or ſeparating of two or more joined in one writ.

St. SEVERINO, a city of Naples, in the province of Calabria, ſituated eaſt longitude 17° 30′, north lat. 39° 16′. This is alſo the name of a town in the pope's territories and marquiſate of Ancona, ſituated twenty miles ſouth-eaſt of Loretto.

SEVERN, a river of South-Britain, which riſing in Montgomeryſhire, runs eaſt till it enters Shropſhire; and having paſſed by Shrewſbury turns ſouth, and diſcharges itſelf into the Briſtol channel.

SEVILLE, a city of Spain, capital of the province of Andaluſia, ſituated on the river Guadalquivir: in W. long. 6°, N. lat. 37° 15′.

SEWER, in the houſehold, an officer who comes in before the meat of a king or noblemen, to place and range it on the table.

SEWER is alſo a paſſage or gutter made to carry water into the ſea or a river, whereby to preſerve the land, *&c.* from inundations and other annoyances.

SEX, ſomething in the body which diſtinguiſhes male from female.

SEXAGENARY, ſomething relating to the number ſixty: thus ſexagenary or ſexageſimal arithmetick, is a method of computation proceeding by ſixties. See ARITHMETICK, p. 418.

SEXAGESIMA, the ſecond Sunday before Lent, or the next to Shrove Sunday, ſo called as being about the ſixtieth day before Eaſter.

SEXAGESIMALS. See ARITHMETICK, p. 418.

SEXTANS, a ſixth part of certain things. The Romans having divided their *as* into twelve ounces, or *unica*, the ſixth part of that, or two ounces, was the ſextans.

Sextans was alſo a meaſure which contained two ounces of liquor, or two cyathi.

SEXTANT, in mathematicks, denotes the ſixth part of a circle, or an arch comprehending ſixty degrees.

The word ſextant is more particularly uſed for an aſtronomical inſtrument made like a quadrant, excepting that its limb only comprehends ſixty degrees.

SEXTILE, the poſition or aſpect of two planets when at ſixty degrees diſtance, or at the diſtance of two ſigns from one another.

SEXTON, a church-officer, whoſe buſineſs is to take care of the veſſels, veſtments, *&c.* belonging to the church, and to attend the miniſter, church-wardens, *&c.* at church.

SEXTUPLE, in muſick, denotes a mixed ſort of triple which is beaten in double time. See MUSICK.

SEXUALISTÆ, among botanical writers, thoſe who have eſtabliſhed the claſſes of plants upon the differences of the ſexes and parts of fructification in plants, according to the modern method, as Linnæus, *&c.* See BOTANY, p. 643.

SEYNE, a river of France, which riſing near Dijon, in Burgundy, runs north-weſt through Champagne and the iſle of France, through Paris, *&c.* and croſſing Normandy falls into the Britiſh channel between Havre-de-grace and Honfleur.

SHAD, in ichthyology. See CLUPEA.

SHADOW, in optics, a privation or diminution of light, by the interpoſition of any opake body; or it is a plane where the light is either altogether obſtructed, or greatly weakened, by the interpoſition of ſome opake body between it and the luminary.

SHADOW, in painting, an imitation of a real ſhadow, effected by gradually heightening and darkening the colours of ſuch figures as by their diſpoſitions cannot receive any direct rays from the luminary that is ſuppoſed to enlighten the piece.

SHAFT *of a column*, in building, is the body thereof between the baſe and capital: ſo called from its ſtraightneſs.

SHAFT, in mining, is the pit or hollow entrance into the mine.

SHAFTSBURY, a borough of Dorſetſhire, twenty-five miles north-eaſt of Dorcheſter; from whence the noble family of Cooper took the title of earl. It ſends two members to parliament.

SHAG, in ornithology. See PELICANUS.

SHAGREEN, or CHAGREEN, in commerce, a kind of grained-leather, prepared, as is ſuppoſed, of the ſkin of a ſpecies of ſqualus, or hound-fiſh, called the ſhagree, or ſhagrain; and much uſed in covering caſes, books, *&c.*

SHAKLES, in a ſhip, are the rings with which the ports are ſhut faſt, by laſhing the port-bar to them. There alſo ſhakles put upon bilbow-bolts, for confining the men who have deſerved corporal puniſhment.

SHAMBLES, among miners, a ſort of niches, or landing places, left at ſuch diſtances in the adits of mines, that the ſhovel-men may conveniently throw up the ore from ſhamble to ſhamble, till it comes to the top of the mine.

SHAMMY, or CHAMOIS-LEATHER, a kind of leather, dreſſed either in oil, or tanned; and much eſteemed for its ſoftneſs, pliancy, and being capable of bearing ſoap without hurt.

The true ſhammy is prepared of the ſkin of the chamois-goat. See CAPRA.

SHANK, in the menage, that part of a horſe's fore-leg which lies between the knee and the fetlock.

SHANKER, or CHANCRE, in medicine. See MEDICINE, p. 132.

SHANNON, the largeſt river in Ireland, which riſing in the county of Leſtrim, runs ſouthwards, dividing the provinces of Leinſter and Connaught; and then turning ſouth-weſt, runs through the province of Munſter; and paſſing by the city of Limeric, afterwards falls into the weſtern or Atlantic ocean.

SHARE *of a plough*, that part which cuts the ground, the extremity forwards being covered with a ſharp-pointed iron, called the point of the ſhare; and the end of the wood behind, the tail of the ſhare. See AGRICULTURE, p. 54.

SHASTER, or SHASTRAM, a ſacred book, containing the religion of the Banians: it conſiſts of three tracts; the firſt of which contains their moral law; the ſecond, the ceremonial; and the third delivers the peculiar obſervances for each tribe of Indians.

SHEAT *of a plough*, a part paſſing through the beam, and faſtened to the ſhare. See AGRICULTURE, p. 54.

SHEATHING, in the ſea-language, is the caſing that part of a ſhip which is to be under water, with fir-board of an inch thick; firſt laying hair and tar, mixed together, under the boards, and then nailing them on, in order to prevent worms from eating the ſhip's bottom.

SHEATS, in a ſhip, are ropes bent to the clews of the ſails,

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ſails; ſerving, in the lower ſails, to haul aft the clews of the ſail; but, in top-ſails, they ſerve to haul home the clew of the ſail cloſe to the yard-arm.

SHEEP, in zoology. See Ovis.

SHEERING, in the ſea-language. When a ſhip is not ſteered ſteadily, they ſay ſhe ſheers, or goes ſheering; or when at anchor ſhe goes in and out, by means of the current of the tide, they alſo ſay ſhe ſheers.

SHEERS, in a ſhip, are two maſts ſet acroſs at the upper end of each other; a contrivance generally uſed for ſetting or taking out the maſts of a ſhip, where there is no hulk to do that office.

SHEFFIELD, a market-town of Yorkſhire, 38 miles ſouth-weſt of York.

SHEFFORD, a market-town of Bedfordſhire, ſeven miles ſouth-weſt of Bedford.

SHEFFNEL, a market-town of Shropſhire, fourteen miles eaſt of Shrewſbury.

SHEIK, an officer in the moſques of Egypt, whoſe buſineſs is the ſame with that of the imans of Conſtantinople.

Sheik-bellet, in the Turkiſh affairs, a magiſtrate, anſwering to the mayor of a city with us.

SHIELDS, a port-town of the biſhopric of Durham, ſituated at the mouth of the river Tyne, eight miles eaſt of Newcaſtle.

SHEKEL, in Jewiſh antiquity, an ancient coin, worth 2 s. 3 ½ d. ſterling.

SHELF, among miners, the ſame with what they otherwiſe call faſt ground, or faſt country; being that part of the internal ſtructure of the earth, which they find lying even, and in an orderly manner, and evidently having retained its primitive form and ſituation.

SHELL, in natural hiſtory, a hard, and as it were ſtony covering, with which certain animals are defended, and thence called ſhell-fiſh.

As to the formation of a ſhell, it is now generally allowed to be formed by a viſcous fluid compoſed of glue, and ſeveral ſandy particles of an exquiſite fineneſs, which are tranſmitted through an infinite number of little channels to the pores where it tranſpires, condenſes, and hardens. When the animal increaſes in bulk, and the extremity of her body is not ſufficiently covered, it continues to evacuate and build in the ſame manner, finiſhing or repairing her habitation. This viſcous matter is proved, by undeniable experiments, to ariſe from the body of animals, and not from the ſhell, as ſome have imagined.

Foſſile Shells, thoſe found buried at great depths in earth, and often immerſed in the hardeſt ſtones. Theſe foſſile ſhells, as well as thoſe found lying on the ſea-ſhore, make an excellent manure, eſpecially for cold clayey lands; upon which it does not produce nearly ſo great an effect for the two firſt years, as it does in the ſucceeding ones; the reaſon of which is, that it is not then ſufficiently mixed, but in ſucceeding time it breaks itſelf into a number of very ſmall particles, and theſe all become intimately blended with the moleculæ of earth, and produce their effect more properly.

SHELTIE, a ſmall but ſtrong kind of horſe, ſo called from Shetland, or Zetland, where they are produced.

SHEPPY, an iſland at the mouth of the river Medway, making part of the county of Kent.

SHERARDIA, in botany, a genus of plants belonging to the tetrandria monogynia claſs. The corolla conſiſts of one funnel-ſhaped petal; and there are two ſeeds having three teeth. The ſpecies are three, only one of them, *viz.* the arvenſis, or little field-madder, a native of Britain.

SHERBORN, a market-town, twelve miles ſouth-weſt of York.

SHERBRO, a fort at the mouth of the river Sherbro, in Guinea, formerly in the poſſeſſion of the Engliſh.

SHERENESS, a fort on the north-weſt part of the iſle of Sheppey, ſituated at the mouth of the river Medway, to defend its entrance.

SHERIFF, an officer in each county of England, nominated by the king, inveſted with a judicial and miniſterial power, and who takes place of every nobleman in the county during the time of his office.

Sheriff, in Scots law. See Law, Tit. iv. 1.

SHEW-BREAD, among the Hebrews, the name given to thoſe loaves of bread which the prieſts placed every ſabbath day upon the golden table in the ſanctuary. The ſhew-bread conſiſted of twelve loaves, according to the number of the tribes; theſe were ſerved up hot on the ſabbath day, and at the ſame time the ſtale ones which had been expoſed all the week were taken away. It was not lawful for any one to eat of thoſe loaves but the prieſts only: this offering was accompanied with ſalt and frankincenſe, which was burnt upon the table at the time they ſet on freſh loaves.

SHIELD, an ancient weapon of defence, in the form of a light buckler, borne on the arm, to turn off lances, darts, *&c.*

Shield, in heraldry, the eſcutcheon or field on which the bearings of coats of arms are placed. See Escutcheon.

SHILLING, an Engliſh ſilver coin. See Money.

SHIP, a general name for all large veſſels with ſails, fit for navigation on the ſea; except galleys, which go with oars, and ſmack-ſails. See Navigation.

A ſhip is undoubtedly the nobleſt machine that ever was invented; and conſiſts of ſo many parts, that it would require a whole volume to deſcribe it minutely. However, we ſhall endeavour to ſatisfy the reader the more fully on this head, as it is an article of the utmoſt importance. And firſt, to give an idea of the ſeveral parts and members of a ſhip, both external and internal, with their reſpective names in the ſea-language, in Plate CXLVIII. is repreſented a ſhip of war of the firſt rate, with rigging, *&c.*, at anchor: Where A is the cat-head; B, the fore-chains, C, the main chains, D, the mizzen-chains; E, the entering port; F, the hauſe holes; G, the poop lanterns; H, the cheſs-tree; I, the head; K, the ſtern.

L, The bowſprit. 1, 2, Yard and ſail. 3, Gammoning. 4, horſe. 5, Bob ſtay. 6, Sprit-ſail ſheets. 7, Pendants. 8, Braces and pendants. 9, Halliards. 10, Lifts. 11, Clew-lines. 12, Sprit-ſail horſes. 13, Bunt-lines. 14, Standing lifts. 15, Sprit ſail top. 16, Flying jib boom. 17, Flying jib ſtay and ſail. 18, Halliards. 19, Sheets. 20, Horſes.

M, The ſprit-ſail top-maſt. 21, Shrouds. 22, 23, Yard and ſail. 24, Sheet. 25, Lifts. 26, Braces and pendants. 27, Cap. 28, Jack-ſtaff. 29, Truck. 30, Jack flag.

N, The fore-maſt. 31, Runner and tackle. 32, 33, Shrouds. 34, Laniards. 35, Stay and laniard. 36, Preventer

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Preventer-ſtay and laniard. 37, Woolding the maſt. 38, Yard and ſail. 39, Horſes. 40, Top. 41, Crow-foot. 42. Jeers. 43, Yard tackles. 44, Lifts. 45, Braces and pendants. 46, Sheets. 47, Fore tacks. 48, Bow-lines and bridles. 49, Fore bunt-lines. 50, Fore leech lines. 51, Fore top rops. 52, Puttock ſhrouds.

O, The fore top maſt. 53, 54, Shrouds and laniards. 55 Yard and ſail. 56, Stay and ſail. 57, Runner. 58, Back ſtays. 59, Halliards 60, Lifts. 61, Braces and pendants. 62, Horſes. 63, Clew-lines. 64, Bow-lines and bridles. 65 Reef-tackles. 66, Sheets. 67, Bunt-lines. 68, Croſs trees. 69, Cap.

P, The fore top gallant maſt. 70, 71, Shrouds and laniards. 72, Yard and ſail. 73, Back ſtays. 74, Stay. 75, Lifts. 76, Clew lines. 77, Braces and pendants. 78, Bow lines and bridles. 79, Flag ſtaff. 80, Truck. 81, Flag-ſtaff ſtay. 82, Flag of lord high admiral.

Q, The main maſt. 83, 84, Shrouds 85, Laniards. 86, Runner and tackle 87, Pendant of the gornet. 88, Guy of ditto. 89, Sail of ditto. 90, Stay. 91, Preventer ſtay. 92, Stay tackle. 93, Woolding the maſt. 94 Jeers. 95, Yard tacles. 96. Lifts. 97, Braces and pendants. 98. Horſes. 99, Sheets. 100, Tacks 101, Bow-lines and bridles. 102, Crow foot. 103, Top rope 104, Top. 105, Bunt-lines. 106, Leech lines. 107, Yard and ſail.

R, The main top maſt. 108, 109, Shrouds and laniards. 110, Yard and ſail. 111, Puttock ſhrouds. 112, Back ſtays. 113, Stay. 114 Stay ſail and ſtay halliards. 115, Runnets. 116, Halliards. 117, Lifts. 118, Clew-lines. 119, Braces and pendants. 120, Horſes 121, Sheets. 122, Bow-lines and bridles. 123, Bunt-lines. 124, Reef tackles. 125, Croſs trees. 126 Cap.

S, The main top gallant maſt. 127, 128. Shrouds and laniards. 129, Yard and ſail. 130, Back ſtays. 131. Stay. 132, Stay ſail and halliards. 133, Lifts. 134, Braces and pendants. 135, Bow-lines and bridles. 136, Clew-lines. 137, Flag ſtaff. 138, Truck. 139, Flag ſtaff ſtay. 140, Flag ſtanda d.

T, The mizzen maſt 141, 142, Shrouds and laniards. 143, Pendants and burtons. 144, Yard and ſail. 145, Crow foot, 146, Sheet. 147, Pendant lines. 148. Peck brails. 149, Stay ſail. 150, Stay. 151, Derric and ſpann. 152. Top. 153, Croſs jack yard. 154, Croſs jack lifts. 155, Croſs jack braces. 156. Croſs jack ſlings.

V, The mizzen top maſt. 157, 158, Shrouds and laniards. 159. Yard and ſail. 160, Back ſtays. 161, Stay. 162, Halliards. 163, Lifts. 164, Braces and pendants 165, Bow lines and bridles. 166, Sheets. 167, Clew-lines. 168, Stay ſail. 169, Croſs trees. 170, Cap. 171. Flag ſtaff. 172, Flag ſtaff ſtay. 173, Truck 174 Flag union 175 Enſign ſtaff. 176. Truck. 177. Enſign. 178, Poop ladder. 179, Bower cable.

Thus we have pointed out the external parts, maſts, rigging, &c. an account of all which may be ſeen under their reſpective articles MAST, HULL, ROPE, RUDDER, &c.

In Plate CXLIX. is repreſented the ſection of a firſt-rate ſhip of war, ſhewing the inſide thereof: where A is the head; containing, 1, The ſtem. 2, The knee of the head, or cut water. 3, The lower and upper cheek. 4, The tail-board. 5, The figure. 6, The gratings. 7, The brackets. 8, The falſe ſtem. 9, The breaſt hooks. 10, The hauſe hole. 11, The bulk head, forward. 12, The cat-head. 13, The cat-book. 14, Neceſſary ſeats. 15, The manger within board. 16, The bowſprit.

B, Upon the forecaſtle. 17, The gratings. 18, The partners of the fore maſt. 19, The gun wale. 20, The belfry. 21, The funnel for the ſmoke. 22, The gangway going off the forecaſtle. 23, The forecaſtle guns.

C, In the forecaſtle. 24, The door of the bulk head, forward. 25, The officers cabbins. 26, The ſtair caſe. 27, The fore top ſail ſheet bits. 28, The beams. 29, The car lines.

D, The middle gun-deck forward. 30, The fore-jeer bits. 31, The oven and furnace of copper. 32, The captain's cook-room. 33, The ladder, or way up into the forecaſtle.

E, The lower gun-deck forward. 34, The knees fore and aft. 35, The ſpirketings, or the firſt ſtreak next to each deck; the next under the beams being called clamps. 36, The beams of the middle gun deck, fore and aft. 37, The car-lines of the middle gun-deck, fore and aft. 38, The fore bits 39, The after, or main bits. 40, The hatchway to the gunner's and boatſwain's ſtore rooms. 41, The jeer capſton.

F, The orlap. 42, 43, 44, The gunner's, boatſwain's, and carpenter's ſtore-rooms. 45, The beams of the lower gun-deck. 46, 57, The pillars and the riders, fore and aft. 48, The bulk head of the ſtore-rooms.

G, The hold. 49, 50, 51, The foot-hook rider, the floor-rider. and the ſtandirt, fore and aft. 52. The pillars. 53, The ſtep of the fore maſt. 54, The keelſon, or falſe keel, and dead riſing. 55, The dead wood.

H, A midſhips in the hold. 56, The floor timbers. 57, The keel. 58, The well. 59, The chain pump. 60, The ſtep of the main maſt. 61, 62, Beams and car-lines of the orlop, fore and aft.

I, The orlop a midſhips. 63, The cable tire. 64, The main hatchway.

K The lower gun-deck a-midſhips. 65, The ladder leading up to the middle gun-deck. 66, The lower tire or ports

L, The middle gun-deck a-midſhips. 67, The middle tire ports. 68, The entering port. 69, The main jeer bits. 70, Twiſted pillars or ſtantions. 71, The capſton. 72, The gratings. 73, The ladder leading to the upper deck.

M, The upper gun-deck a-midſhips. 74, The main top-ſail ſheet bits. 75. The upper partners of the main maſt. 76, The gallows on which ſpare top-maſts, &c. are laid. 77. The fore ſheet blocks. 78, The rennets. 79. The gun wale. 80, The upper gratings. 81, The drift brackets. 82, The piſs dale. 83, The capſton pall.

N, Abaft the main maſt. 84, The gang-way off the quarter-deck. 85, The bulkhead of the coach. 86. The ſtair-caſe down to the middle gun-deck. 87, The beams

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of the upper deck. 88, The gratings about the main-maſt 89, The coach, or council-chamber. 90, The ſtair-caſe up to the quarter-deck.

O, The quarter-deck. 91, The beams. 92, The carlines. 93, The partners of the mizzen maſt. 94, The gangway up to the poop. 95, The bulk-head of the cuddy.

P, The poop. 96, The trumpeter's cabin. 97, The tafferel.

Q, The captain-lieutenant's cabbin.

R, The cudddy, uſually divided for the maſter and ſecretary's officers.

S, The ſtate-room, out of which is made the bed-chamber, and other conveniences for the commander in chief. 98, The entrance into the gallery. 99, The bulk-head of the great cabbin. 100, The ſtern-lights and after galleries.

T, The ward-room, allotted for the lieutenants and land-officers. 101, The lower gallery. 102, The ſteerage and bulk-head of the ward-room. 103, The whip-ſtaff, commanding the tillar. 104, The after ſtair-caſe down to the lower gun-deck.

V, Several officers cabbins abaft the main-maſt, where the ſoldiers generally keep guard.

W, The gun-room. 105, The tillar commanding the rudder. 106, The rudder. 107, The ſtern-poſt. 108, The tillar-tranſom. 109, The ſeveral tranſoms, *viz.* 1, 2, 3, 4, 5. 110 The gun-room ports, or ſtern-chaſe. 111. The bread-room ſcuttle, out of the gun-room. 112. The main capſton. 112, The main capſton. 113. The pall of the capſton. 114, The partner. 115, The bulk-head of the bread room.

X, The bread-room Y, The ſteward's room, where all proviſions are weighed and ſerved out. Z, The cock-pit, where are ſubdiviſions for the purſer, the ſurgeon, and his mates.

AA. The platform, or orlop, where proviſion is made for the wounded in time of ſervice. 116, The hold abaft the main-maſt. 117, The ſtep of the mizen maſt. 118. The keelſon, or falſe keel. 119, The dead-wood, or riſing.

Different kinds of SHIPS. All ſhips at firſt were of the ſame form, whatever uſes they were deſigned for; but the various ends of navigation, ſome of which were better anſwered by one form, ſome by another, ſoon gave occaſion to build and fit out ſhips, not only different in bigneſs, but alſo in their conſtruction and rigging: and as trade gave occaſion to the fitting out large fleets of different kinds of merchant-ſhips; ſo ſhips of war became neceſſary, to preſerve them to their juſt proprietors.

SHIPS OF WAR have three maſts, and a bowſprit, and are ſailed with ſquare ſails; the other parts being as deſcribed above, and repreſented in Plate CXLVIII. They are divided into ſeveral orders, called *rates*; that is, their degree or diſtinction as to magnitude, burden, *&c.* The rate is uſually accounted by the length and breadth of the gun-deck, the number of tons, and the number of men and guns the veſſel carries. There are ſix rates, *viz.*

A common firſt-rate man of war has its gun-deck from 159 to 178 feet in length, and from 44 to 51 broad. It contains from 1313 to 2000 tons; has from 706 to 1000 men, and carries from 96 to 100 guns. But one of the moſt conſiderable firſt-rate ſhips was that built at Woolich in 1701: the dimenſions whereof are as follow: The length, 210 feet; number of guns, 110; number of men, 1250; number of tons, 2300; draught of water, 22 feet; the mainſail in length 54 yards, depth 19; main maſt in length 39 feet, in diameter 38 inches; weight of the anchor 82 Cwt. 1 qr 14 lb; cable in length 200 yards, diameter 22 inches.—The expence of building a common firſt rate, with guns, tackling, and rigging is computed at 60,000 *l.* ſterling.

Second-rate ſhips have their gun-decks from 153 to 165 feet long, and from 41 to 46 broad: they contain from 1086 to 1482 tons; and carry from 524 to 640 men, and from 84 to 90 guns.

Third rates have their gun-decks from 140 to 150 feet in length, from 37 42 feet broad: they contain from 871 to 1262 tons; carry from 389 to 476 men, and from 64 to 80 guns.

Fourth rates are in length on the gun-decks from 118 to 146 feet, and from 29 to 38 broad: they contain from 448 to 915 tons; carry from 226 to 346 men, and from 48 to 60 guns.

Fifth rates have their gun-decks from 100 to 120 feet long, and from 24 to 31 broad: they contain from 259 to 542 tons; and carry from 145 to 190 men, and from 26 to 44 guns.

Sixth rates have their gun-decks from 87 to 95 feet long, and from 22 to 25 broad: they contain from 152 to 256 tons; carry from 40 to 110 men, and from 16 to 24 guns.

It is to be obſerved, that the new-built ſhips are much larger, as well as better, than the old ones of the ſame rate; whence the double numbers all along; the larger of which expreſs the proportions of the new built ſhips, as the leſs thoſe of the old ones.

MERCHANT SHIPS are eſtimated by their burden; that is, by the number of tons they bear, each ton reckoned at 2000 lb weight; this eſtimate being made by gauging the hold, which is the proper place of loading.

Beſides thoſe mentioned above, there are other forms: as, 1. The bilander, (Plate CXLIX. fig. 2.) which has rigging and ſails not unlike a hoy, only broader and flatter: bilanders are ſeldom above twenty-four tons, and can lie nearer the wind than a veſſel with croſs-ſails can do. 2. Bomb-veſſels, (*ibid.* fig. 3.) have ſometimes three maſts, and ſquare ſails, as repreſented; but they are alſo frequently ketch-faſhion, with one maſt and a mizen. 3. Brigantines (*ibid.* fig. 4.) are now diſuſed; but had two maſts, and ſquare ſails. 4. Hag-boats (*ibid.* fig. 5.) are maſted and ſailed ſhip-faſhion, but are built in the form of the Dutch fly-boat. 5. Hoys (*ibid.* fig. 6.) are fitted with one maſt and a ſprit-ſail; whoſe yards ſtand fore and aft like a mizen, ſo that it can lie near the wind. 6. Hulks (*ibid.* fig. 7.) are generally old ſhips cut down to the gun-deck, and fitted with a large wheel, for men to go in when careening: it has alſo ſeveral capſtons fixed on its deck, for ſetting ſhips maſts. 7. Ketches (*ibid* fig. 8.) are fitted with two maſts; and their main-ſail and top-ſail ſtand ſquare as thoſe of ſhips do, but their fore-ſail and jibbs as thoſe of hoys do. 8. Lighters (*ibid.* fig. 9.) are veſſels made uſe of for laying down or ſhifting the moorings, for bringing aſhore or carrying on broad ſhips cables, anchors, *&c.* 9. Pinks (*ibid.* fig. 10.)

ſail.

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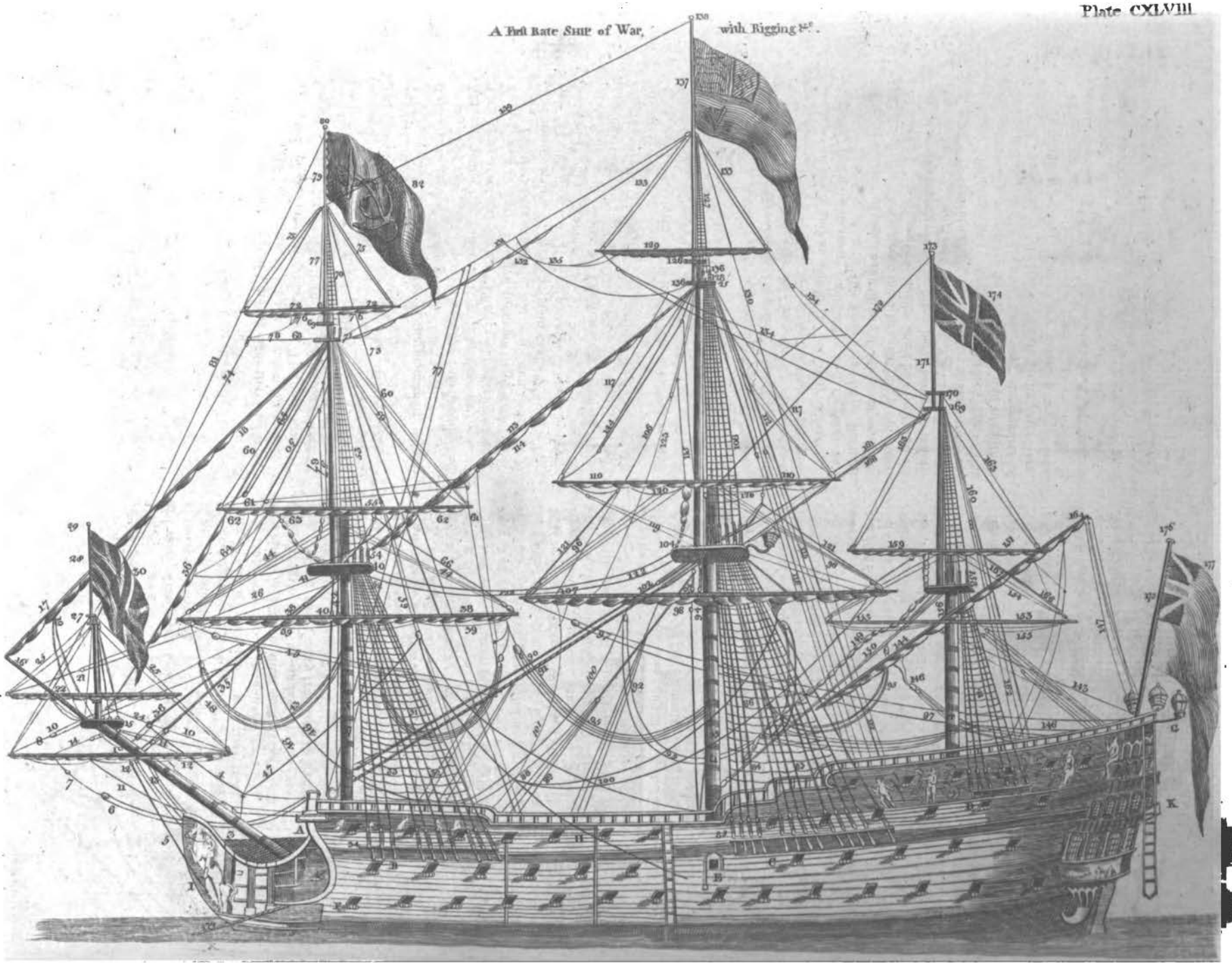
Plate CXLVIII

A First Rate SHIP of War, with Rigging &c.



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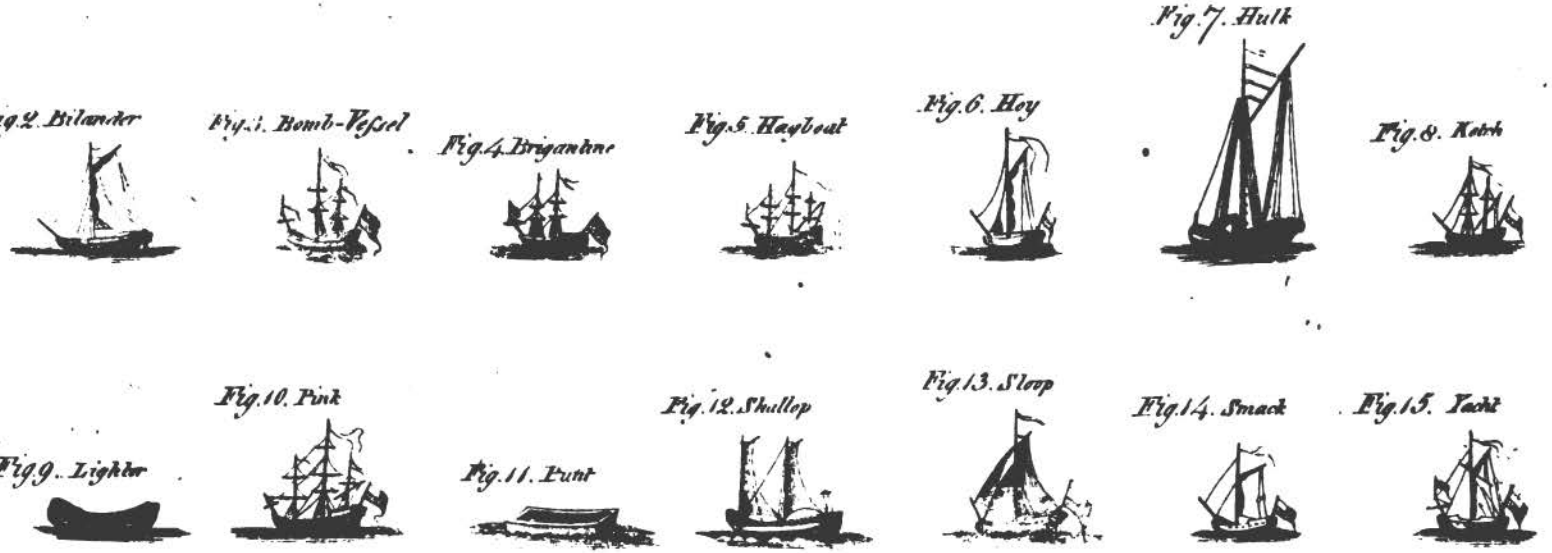
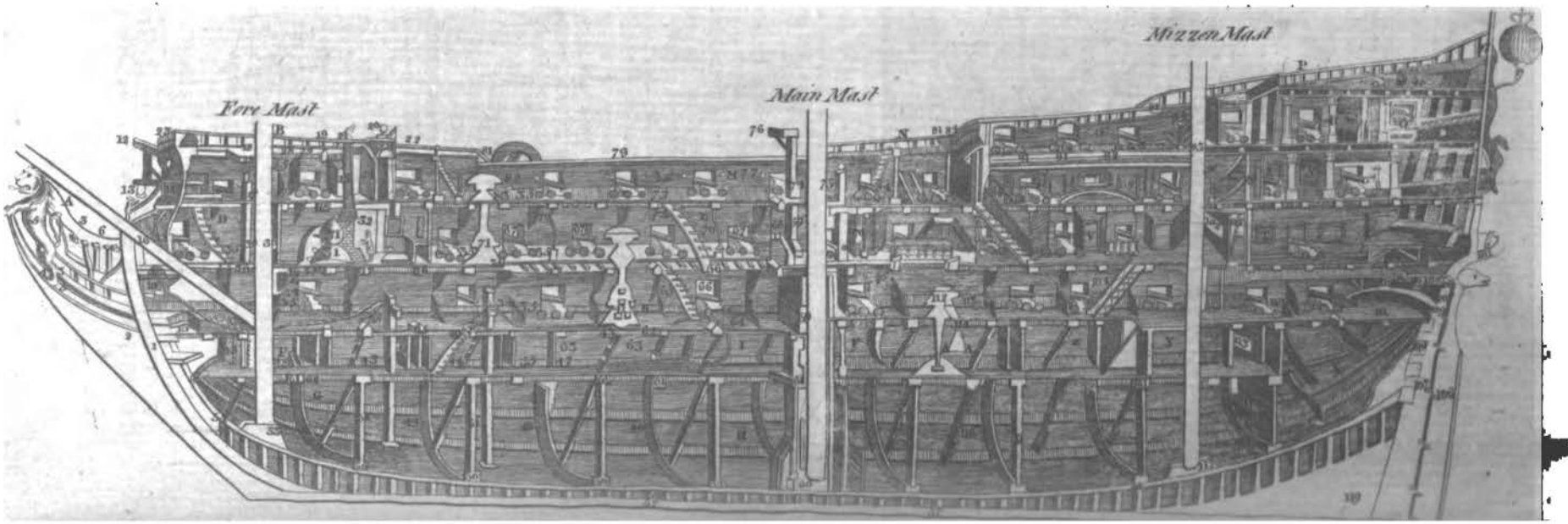


Fig.1. The Section of a First Rate Ship of War, Shewing its various Timbers and Apartments



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ſail with three maſts, ſhip-faſhion; but are round ſterned, with a ſmall projection above the rudder. 10. Punts (*ibid.* fig. 11.) are built ſquare, and uſed about the docks for fetching clay and other ſervices as the maſter ſhipwright wants them for. 11. Shallop (*ibid.* fig. 12.) is a ſmall light veſſel, with only a ſmall main and fore maſt, and lugg ſails, to haul up and let down on occaſion. 12. Sloops (*ibid.* fig 13.) have only one maſt, with ſhoulder-of-mutton, ſquare, lugg, and ſmack ſails. 13. Smacks (*ibid.* fig. 14.) are tranſporting veſſels, with one maſt, and an half ſprit-ſail. 14. Yachts (*ibid.* fig. 15.) have only one maſt, with an half ſprit or ſmack ſail, and ſometimes ketch-faſhion.

The moſt celebrated ſhips of antiquity are thoſe of Ptolemy Philopater. One was 280 cubits long, 38 broad, and 48 high, each cubit being 1 Engliſh foot 5½ inches, and carried 400 rowers, 400 ſailors and 3000 ſoldiers. Another which the ſame prince made to ſail on the Nile, we are told, was half a ſtadium long. Yet theſe were nothing in compariſon with Hiero's ſhip, built under the direction of Archimedes; on the ſtructure whereof Moſchion wrote a whole volume. There was wood enough employed in it to make 50 galleys: it had all the variety of apartments of a palace; ſuch as banqueting-rooms, galleries, gardens, fiſh-ponds, ſtables, mills, baths, and a temple to Venus. It was encompaſſed with an iron rampart, eight towers, with walls and bulwarks, furniſhed with machines of war; particularly one, which threw a ſtone of 300 pounds, or a dart 12 cubits long, the ſpace of half a mile, with many other particulars related by Athenæus.

Conſtruction of SHIPS. Naval architecture may be divided into three principal parts: 1. To give the ſhip ſuch a figure and proportion as may ſuit the ſervice ſhe is deſigned for. 2. To find the true form of all the pieces of timber that ſhall be neceſſary to compoſe ſuch a ſolid. 3. To make proper accommodations for guns, ammunition, proviſions, and apartments for all the officers, and likewiſe room for the cargo.

As to the firſt part, the length of the keel, greateſt breadth, depth in the hold, height between decks and in the waſte, and ſometimes the height and breadth of the wing-tranſom, in ſhips for the merchants ſervice, are agreed on by contract; and from theſe dimenſions the builder forms a draught ſuitable to the trade the ſhip is deſigned for. The firſt thing that is generally done, is to lay down the keel, the ſtem, and ſtern-poſt, upon the ſheer-plane, or plane ſuppoſed to paſs through the middle line of the keel, ſtem, and ſtern-poſt, cutting the ſhip in two halves lengthwiſe. They next determine the proper ſtation of the mid-ſhip timber, where a perpendicular is erected, and is generally about two thirds of the keel before the ſtern-poſt: on this line the given depth of the hold is ſet off, from the upper ſide of the keel; to obtain which point, the thickneſs of all the timber and plank muſt be added to the height agreed on. This being fixed, will enable us to determine the upper-height of the extreme or greateſt breadth of the ſhip; which, ſometimes, is that very point; and from the ſame place the lower height of the breadth muſt be determined. The two main heights of the breadth-lines, which nearly unite abaft and afore, are next determined. The height of the breadth-line of the top-timber is next formed; being limited in the midſhip by contract, but afore and aft only by the judgment and fancy of the artiſt. If a ſquare ſtern is deſigned, the breadth at the wing-tranſom is limited, being generally about two thirds of the greateſt breadth. The artiſt next fixes the breadth of the top-timber, and then deſcribes the two half-breadth lines. After theſe are formed the places where the ſeveral timbers are fixed: and for forming the midſhip-frame, radii are aſſumed at pleaſure, till the ſweeps are made to pleaſe the fancy and judgment of the artiſt. When this midſhip-frame is formed, a pattern or mould is made to fit exactly to the curve, and the dead-riſing, or water-line; and by this and a hollow mould, all the timbers are formed, as far as the riſing-line, which is parallel to the lower height of the breadth-line.

We come next to conſider the upper-works, or all that is above water, called the dead-work: and here the ſhip muſt be narrower, by which means ſhe will ſtrain leſs by working the guns, and the main-ſail will be eaſier trimmed, as the ſhrouds ſpread leſs than they would otherwiſe do. But though theſe advantages are gained by narrowing a ſhip above water, yet great care muſt be taken not to narrow her too much, leſt there ſhould not be ſufficient room upon the upper deck for the guns to recoil. The ſecurity of the maſts ſhould likewiſe be conſidered, which require ſufficient breadth to ſpread the ſhrouds: though this may be aſſiſted by enlarging the breadth of the channels.

Principal qualities belonging to SHIPS. A ſhip of war ſhould carry her lower tire of guns four or five feet above water; a ſhip for the merchants ſervice ſhould ſtow the cargo well; and both of them ſhould be made to go well; carry a good ſail, ſteer well, and lie-to eaſily in the ſea. 1. To make a ſhip carry a good ſail, Mr Du Hamel recommends a flat floor-timber, and ſomewhat long, or the lower futtock pretty round; alſo a ſtraight upper futtock, and the top timber to throw the breadth out aloft; and at any rate, to carry her main-breadth as high as the lower-deck; for if the rigging be well adapted to ſuch a body, and the upper-works heightened as much as poſſible ſo as all to concur to lower the centre of gravity, there will be no room to doubt of her carrying a good ſail. 2. To make a ſhip ſteer well, and anſwer the leaſt motion of the helm, the faſhion-pieces ſhould be well formed, the tuck carried pretty high, and the midſhip-frame carried pretty forward; alſo there ſhould be a conſiderable greater draught of water abaft than afore, a great rake forward, and none abaft, and a ſnug quarter-deck and fore-caſtle: all theſe will make a ſhip ſteer well. But to make her feel the leaſt motion of her helm, it will be neceſſary to regard her maſts; for a ſhip that goes well, will certainly ſteer well. 3. To make a ſhip carry her guns well out of the water, is effected by a long floor-timber, and not of great riſing, a very full midſhip-frame, and low tuck, with light upper-works. 4. To make a ſhip go ſmoothly through the water, without pitching hard, her keel ſhould be long, her floor long and not riſing high afore or aft; the area or ſpace contained in the fore-body ſhould alſo be duly proportioned to that of the after-body, according to the reſpective weights they are to carry. 5. To make a ſhip keep a good wind, ſhe ſhould have a good length by the keel, not too broad, but pretty deep in the hold; which will make her floor-

timbers

timber ſhort, and riſing great. As ſuch a ſhip will meet with great reſiſtance in the water going over the broad ſide, and but little when going a-head, ſhe will not fall much to the leeward. Now ſome ſhip-builders imagine, that it is impoſſible to make a ſhip carry her guns well, carry a good ſail, and be a prime ſailor at the ſame time; becauſe it requires a very full bottom to gain the two firſt qualities, and a ſharp-bottomed ſhip beſt anſwers the latter: but when it is conſidered, that a full ſhip will carry a great deal more ſail than a ſharp one, a good artiſt may ſo form the body as to have all theſe three good qualities united, and likewiſe ſteer well; for which purpoſe, Mr Du Hamel recommends ſomewhat more in length than has been commonly practiſed.

SHIPTON, a market-town, twenty-four miles ſouth-eaſt of Worceſter.

SHIRE, in geography, ſignifies the ſame as county; being originally derived from a Saxon word which ſignifies *to divide*.

SHIVERS, in the ſea language, names given to the little rollers or round wheels of pulleys.

SHOAD, among miners, denotes a train of metalline ſtones, ſerving to direct them in the diſcovery of mines.

SHOAL, in the ſea-language, denotes a place where the water is ſhallow.

SHOE, a covering for the foot, uſually made of leather, by the company of cordwainers.

SHOE *for an anchor*, in a ſhip, the place for the anchor to reſt, and fitted to receive the ſtock, *&c.* ſo as to prevent the ſheets, tacks, and other running rigging, from galling, or being entangled with the flooks.

SHORE, a place waſhed by the ſea, or by ſome large river,

Count Marſigli divides the ſea-ſhore into three portions: the firſt of which is that tract of land which the ſea juſt reaches in ſtorms and high tides, but which it never covers; the ſecond part of the ſhore, is that which is covered in high tides and ſtorms, but is dry at other times; and the third is the deſcent from this, which is always covered with water.

SHOREHAM, a borough and port town of Suſſex, twenty-five miles eaſt of Chicheſter. It ſends two members to parliament.

SHORT-HAND WRITING.

AS STENOGRAPHY, or the Art of SHORT-HAND WRITING, when well underſtood, and rendered familiar by practice, is attended with many valuable conſequences, we ſhall, without attempting to enumerate the infinite variety of ſyſtems that have been publiſhed, furniſh our readers with that ſyſtem which appears to be the moſt eaſy, beautiful, and expeditious, and at the ſame time calculated for general uſe.

PART I.

THE Alphabet being the foundation upon which the perfection of the art depends, great care muſt be taken to eſtabliſh it in the beſt manner. All the ſimple ſounds muſt be repreſented by the ſhorteſt marks poſſible. We muſt, therefore, not only reject the complex marks eſtabliſhed by cuſtom in our common alphabet, but alſo thoſe letters themſelves whoſe ſounds may always be ſignified by others; and ſimple marks muſt be provided for ſuch ſimple ſounds as are by cuſtom repreſented by two letters a-piece: for which reaſon, it is neceſſary to examine the alphabet, and to fix the number of characters, before we proceed to inveſtigate the marks which are to repreſent them. Firſt, then, let us conſider what number of conſonants may be requiſite. We ſhall afterwards treat of the vowels, which are to be repreſented by points or dotts.

The conſonants, according to our uſual reckoning, are, *b, c, d, f, g, h, j, k, l, m, n, p, q, r, s, t, v, w, x, y, z*. But cuſtom differs from nature in inſerting the letters *c, q, w, x, y*, and in omitting *sh, zh, th, dh, ch*: for *c* having always either the ſound of *k* or *s*, *q* that of *koo*, *w* of *oo*, *x* of *ks*, and *y* of *i*; in an alphabet according to nature none of theſe could have found a place; and *sh, zh, th, dh, ch*, repreſenting ſingle conſonantal ſounds as much as *ph* does, whoſe power is that of *f*, ought all to have been denoted by ſingle characters, as moſt of them are in the alphabets of other languages.

The natural alphabet, therefore, might have been taken for our ſhort-hand one, rejecting the ſuperfluous letters *c, q, w, x, y*, and inſerting in their ſtead *sh, zh, th, dh, ch*: but having ſome marks that were not conveniently applicable to any other purpoſe, and it being a compendium to repreſent two letters by a ſingle character, as in the *q* and *x*, and ſome eaſe to the reader to retain at the beginning of words the *w* and *y*, to which he has been long accuſtomed; we ſhall, totally rejecting the *c*, appropriate diſtinct marks to denote *q, x, w, y*, when they are initial letters; not ſcrupling however in other ſituations, if it prove more convenient, to denote them by *k, ks, oo*, and *i*, reſpectively.

Zh never had any particular mark to ſignify it by; and cuſtom has, for a long period of time, ceaſed to make any diſtinction in writing between the *th* and *dh*: and as the adherence to nature in making nice diſtinctions, where cuſtom has not, would be ſo far, in this caſe, from ſerving any valuable purpoſe of ſhort-hand, that it would rather, on the contrary, render the learning to write and read it more difficult, we have, in purſuance of our plan, complied with cuſtom in dropping the *zh*, and marking the ſounds both of *th* and *dh* by the ſame character.

S and *z* bear the ſame relation to each other, that the *th* and *dh* do; and the ſound of *z* in our cuſtomary way of writing is very frequently expreſſed by *s* except in caſes when it occurs at the beginning of words, which happen but very ſeldom. Theſe conſiderations induce us to ſecure the great convenience which ariſes from ſignifying both *s* and

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and *z* by one mark. And, for a like reaſon, we ſhall make one mark repreſentative both of *ſ* and *v*. The ſenſe of the place will eaſily diſcover, to a man tolerably acquainted with Engliſh, which of the two it muſt there repreſent; and the reader will be taught, when the characters are appropriated to the conſonants, how, in moſt caſes, entirely to remove any little ambiguity that poſſibly might ariſe from it. Our alphabet will then conſiſt of the following conſonants, *viz.* *b*, *d*, [*ſ v*] *g*, *h*, *j*, *k*, *l*, *m*, *n*, *p*, *q*, *r*, [*s z*.] *t*, *w*, *x*, *y*, *ch*, *ſh*, *th*.

The number of our conſonants being thus ſettled, and the reaſons for fixing upon that number being given; the next buſineſs muſt be, to invent as many ſimple marks, eaſy to be made and diſtinguiſhed from each other, as are neceſſarily required to repreſent them. They muſt be ſimple, if brevity be conſulted; and they muſt be eaſily diſtinguiſhable from each other, to avoid the confuſion ariſing from miſtaking one letter for another.

Nature affords us four ſtraight lines, ſufficiently diſtinguiſhable from each other, by their horizontal, perpendicular, and inclined poſition, to execute our deſign by; (ſee Plate CL. N° 1.) but it affords only theſe four. In this ſcarcity of ſtraight lines, recourſe muſt be had to curved ones for a further ſupply. The four ſtraight lines bent in the following manner, that is to ſay, the horizontal upwards and downwards, the perpendicular and inclined ones to the right and left, will each of them furniſh two more very good ſhort-hand marks; *ibid.* N° 2.

The number of marks thus increaſed ſtill falls ſhort of ſupplying our wants. The beſt expedient to remedy this defect, is the addition of a little twirl to the beginning of as many of the foregoing marks as there will be occaſion for. It is eaſily and quickly made, when the marks are formed ſeparately; and the twirled marks are joined to preceding ones in as little time as the plain ones. N° 3. 4.

A ſufficient number of proper marks being thus obtained, it remains that each of them be appropriated to the particular conſonant which it is to repreſent. Eaſy as this may ſeem, it is, however, a point of the greateſt nicety; and demands, not only the moſt careful conſideration, but alſo the moſt aſſiduous application to continual trials and alterations. A ſhort-hand alphabet may have all its characters ſimple, eaſy, and diſtinguiſhable, when ſeparately formed; and yet not be a perfect one. To merit that title, it is further requiſite, that they be ſo contrived and adjuſted, that all the conſonants occurring in any word may be eaſily, beautifully, and interlineally joined together, betwixt two given parallel lines, without taking off the pen. Experience has taught quick writers even of long-hand, that the joining all the letters of a word together contributes much to diſpatch, though they are obliged to make little additional ſtrokes for that purpoſe.

Let us then conſider, to what particular conſonant each of our marks is to be appropriated; and begin with the four ſtraight lines.

The firſt of theſe lines, *viz.* the horizontal, as it goes ſtraight forwards, can never exceed the limits of the given parallels, whatever part it begins from; and therefore, in a ſhort-hand formed for lineal beauty, it muſt be appropriated to that conſonant which, of all others, occurs the oftneſt, and challenges, of right, the moſt commodious character for beauty and diſpatch. Now the conſonant that occurs the moſt frequently in our language (and perhaps in moſt others) is the *s*; which has a property, peculiar to itſelf, of mixing with other conſonants before or after it, without the intervention of a vowel. The plural number of moſt of our ſubſtantives, and the third perſon ſingular of our verbs, are formed by it; which muſt occaſion the moſt frequent repetition of it; ſo that, being undoubtedly the commoneſt of all our conſonants, it muſt of neceſſity be denoted by the horizontal ſtraight line.

The ſecond ſtraight line, or perpendicular, is alſo a very eaſy mark, and, ſeparately made, even preferable to the other; but as, in union with others, it may endanger our deſcending below the line, it muſt therefore be allotted to a common conſonant, and one alſo that will the leaſt occaſion us to run that hazard. Now the *t* has, in fact, theſe and other properties that entitle it to this perpendicular ſtraight line.

The third ſtraight line, by its peculiar inclination, is adapted to a very eaſy and convenient joining with other characters; becauſe our cuſtomary method of inclining the letters, in common writing, teaches us to form it with equal readineſs upwards or downwards, as the keeping the previous or following marks within the preſcribed parallels ſhall require. The conſonant, therefore, that claims this character, is the *r*, which makes ſo many of our double conſonants (as we call them) and admits any other ſingle one to follow it immediately. The ſtraight line then which ſlopes downwards to the left, is *r*

The laſt line of the four ſtraight ones, by its direction or ſlope to the right, is awkward to make (and therefore never is made) upwards, like the foregoing, to which it unites the moſt readily. Its properties, upon trial, ſuit beſt with the occurrency of the conſonants *f* or *v*.

The twirl being formed to the left hand in theſe four marks, (N° 5.) diſqualifies them from an eaſy junction with any preceding conſonant. They muſt then, for that reaſon, be aſſigned to ſuch conſonants as occur the ſeldomeſt in the middle or at the end of words, or to ſuch as may be otherwiſe ſignified when they do occur in ſuch ſituations. Now the *h*, or *j*, are rarely to be met with in the middle of words, unleſs immediately preceded by ſome prepoſition, as *inhabit*, *reject*, &c. in which caſe, the reader will be taught hereafter how to write them: and when *x* and *y* are not at the beginning of words, they may be expreſſed by *ks*, and the dot for the vowel *i* reſpectively. The properties of theſe four letters agreeing well with thoſe of the four marks, luckily point out a uſe for four eaſy characters, which could not however have been conveniently allotted to any other conſonants; and the following appropriation of them, upon trial, is found to be the moſt commodious, *viz.* the firſt for *h*, the ſecond for *j*, the third for *x*, and the fourth for *y*.

K is a very common conſonant; and the frequency of its occurrence will be much increaſed by its being made ſo often repreſentative of the rejected *c*, and *ks* of *x*: a character, therefore, which is not only eaſy to be made, but which will alſo join readily with all the reſt, without running either above or below the line, muſt be appropriated to it. The horizontal ſtraight line, with the additional twirl, will, for theſe reaſons, be the moſt commodious. But as the diſtinguiſhing the *k* and *q*, at the beginning of words eſpecially, will, in ſome degree, facilitate the reading; the horizontal ſtraight line with the twirl above is made for *k*, with the twirl below for *q*, when they are initial letters.

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In all other cafes, theſe two marks are uſed promiſcuouſly for *k* or *q*, whenever a more eaſy, beautiful junction may by that means be obtained; the one joining evidently much better with the characters which are written upwards, the other with thoſe downwards.

But to give a detail of all the reaſons for the appropriation of each particular mark to each conſonant, would prove tedious. Moſt of them cannot eſcape the obſervation of an attentive practiſer as he goes along. It will, therefore, be ſufficient to aſſure the reader, that no pains was ſpared to adjuſt the alphabet to the utmoſt nicety, by ſuch an exact attention to continual trials and amendments as was neceſſary to aſcertain the preference of the diſpoſition of the characters in it to any other that could poſſibly have been pitched upon amongſt that almoſt infinite variety into which they might have been thrown; and that, if he has the curioſity to make the experiment, he will find, that no change can be made in the allotment of the marks, but what will be attended with conſiderable diſadvantage.

Two marks are alloted to *b*; (ſee Table of the Alphabet, Plate CL.) The firſt of theſe marks is the beſt when ſeparately formed, but does not join well with the *l* or *r*. For ſimilar reaſons, ſome other of the conſonants have more than one mark alloted to them.

One or other of the two marks appointed for *w* is always to be uſed when it is an initial letter; in other ſituations we ſcruple not to expreſs it by a dot in the *o* or *ou*' place, writing *pour* for *power*; eſpecially if it joins not well with the preceding conſonant, or no great ambiguity ariſes thereby.

The marks being thus adjuſted to the particular conſonants which they are to repreſent, let us ſee how any precedent, ſubſequent, or intermediate vowel may be affixed to any of theſe conſonants, as occaſion ſhall require.

In ſeparate letters there is no difficulty, there being five diſtinguiſhable places for any given vowel or point, either preceding or following the conſonant: reckoning, therefore, the vowels *a*, *e*, *i*, *o*, *u*, according to the eſtabliſhed number and ſequence, *a* is to be placed at the beginning of the conſonant, *e* at the end of the firſt quarter, *i* at the end of the ſecond quarter, that is the middle, *o* at the end of the third quarter, and *u* at the end of the conſonant itſelf.

In the perpendicular and inclined letters, the vowels which precede are placed upon the left hand; thoſe which follow, upon the right; becauſe we write from left to right; as for example, *at*, *et*, *it*, *ot*, *ut*; *ta*, *te*, *ti*, *to*, *tu*. N° 6.

In the horizontal letters, the vowels which precede are placed above; thoſe which follow, below; becauſe we write from top to bottom; as, *as*, *es*, *is*, *os*, *us*; *ſa*, *ſe*, *ſi*, *ſo*, *ſu*. N° 7.

In the ſemicircular letters, the vowels *a*, *e*, *o*, *u*, are placed upon the left hand, the *i* above when they precede, and the contrary when they follow, agreeably to the two foregoing remarks; as, *am*, *em*, *im*, *om*, *um*; *ma*, *me*, *mi*, *mo*, *mu*. N° 8.

A vowel between two conſonants may be referred to either, and therefore ſeems to have two places: but in letters which form an angle when joined, this is the caſe of *i* only; for *a* and *e* can only be placed immediately after the firſt conſonant, *o* and *u* only before the laſt; leſt *a* and *e*, if placed before the laſt, ſhould, in the narrow part of the angle, be confounded with *u* and *o* after the firſt; as, *rat*, *ret*, *rit*, *rot*, *rut*. N° 9.

This twofold place of *i* may be of uſe in diſtinguiſhing, when thought neceſſary, the ſhort *i* from the long one, by making it ſhort when placed immediately after the firſt conſonant, long when before the ſecond; as *quit*, *quite*, N° 10

The great difficulty of learning the true pronunciation of our language, occaſioned chiefly by our perplexed, various, and confuſed way of ſpelling, has been always matter of much complaint with all foreigners who have attempted to learn it. But this abſurd irregularity is by far the moſt remarkable, in the cuſtomary management, or rather miſmanagement of the vowels. It is hardly poſſible to give a rule for them, againſt which the exceptions will not be almoſt as numerous as the agreeing inſtances. How frequently do we put two, nay ſometimes three vowels, to expreſs the ſound of one only? What, for example, has the *e* and *a* to do in the word *beauty*? The ſhort-hand writer, however, is not embarraſſed with any of theſe difficulties. He, totally diſregarding the common way of ſpelling, is to inſert only ſuch letters as are pronounced; and muſt conſequently write the word *beauty* thus, *buty*. But the inſertion of more vowels than are neceſſary to the ſound is not the only inſtance of irregularity to be met with;—there being more than five vowel-ſounds in our language; and cuſtom, having allotted only five letters to ſignify them all by, often makes one vowel expreſs two or three different ones nay, even diphthongs or combinations of vowels. We therefore, taking the advantage which cuſtom in this caſe affords us, ſhall extend the power of our dots or points to the ſame degree. The fairneſs and propriety of doing this will more fully appear upon a particular examination of all the vowels in their order.

And firſt, in common writing, the letter *a* has three powers, *viz.* that of *a*, of *ai* or *ay*, and of *au* or *aw*; as in the words *father*, *fable*, *fall*, or *amen*, *able*, *altar*; which are pronounced all one as if they had been written *father*, *faible*, *faul*, or *amen*, *aible*, *aultar*: ſo that we are fairly authoriſed to extend the power of our vowel-or point to the ſame degree in all other inſtances.

The vowel *e* ſometimes expreſſes ſingly the ſound that two of them are often made for, as in, *be*, *me*, *we*; where its ſound is the ſame as that of two *e*'s, as in *fee*, *tree*, *agree*, &c. We are therefore free to uſe one *e* in this caſe, whenever it ſuits our purpoſe, as well as for *ea*, *ey*, *ei*, *eo*; for of what uſe is the latter of theſe vowels in *pea*, *prey*, *beiſer*, *people*, but to puzzle children and foreigners?

The ſame irregularity and confuſion is obſervable in the cuſtomary management of the other vowels, *i*, *o*, and *u*; they each of them ſingly expreſſing ſeveral different ſounds, which alſo are denoted at other times by ſeveral different combinations of them. The vowel *i*, for inſtance, when it is ſhort, is ſounded in Engliſh as *ee*, agreeable to the pronunciation of it in moſt foreign languages; when long, it has always the ſound of a diphthong, or combination of the two vowel-ſounds, (which we might expreſs by the open *a* or *au*, and the ſhort *i* or *ee*;) which ſound or diphthong is alſo ſometimes expreſſed by *oi*, as *fill*, *file*, *foil*, *fin*, *fine*, *foin*.

In like manner, the vowel *o* has ſeveral different ſounds; as in the words *pol*, *pole*, *do*: the ſound of the *o* in *pole*, is ſometimes expreſſed by *ow*, as to *ſow*; ſometimes by *wo*, as *ſword*; ſometimes by *oa*, as *ſoal*; its ſound in *do*, by *oo*, *wo*, and *ough*, as *too*, *two*, *through*.

And laſtly, the ſound of *u* (which is always really a diphthong,

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thong, expreſſible by the combination of the two vowel ſounds *ee* and *oo*) is denoted in a great variety of ways in our common ſpelling, viz. by *u*, *ue*, *eu*, *ew*, *ieu*, *iew*, *ugh*, *eau*, *you*; as in the words *tune*, *due*, *few*, *adieu*, *view*, *hugh*, *beauty*, *you*. We are therefore certainly at liberty to repreſent all theſe by a point, in the place of the vowel *u*; and thus not only all the ſingle vowels, but all the combinations of them, are expreſſible by the ſhorteſt and eaſieſt of all marks, *viz.* a dot in the place of the vowel of neareſt ſound.

We will now proceed to examine what further uſe we can make of theſe marks or letters for the purpoſes of ſhort-hand. And as numeral figures exhibit to us a kind of ſhort-hand with which every one is acquainted, an alluſion to them will perhaps explain what we have to ſay hereupon.

Obſerve, then, the figures by which the words or numbers, one, five, four, ſix, are expreſſed in the Roman characters, which are likewiſe ſome of thoſe which we make uſe of; I, V, IV, VI. Here we ſee the figure I is conſidered in three different ſituations, as ſtanding by itſelf, cloſe before, and cloſe after another figure: and has accordingly three different powers, of numeration, ſubtraction, and addition. When it ſtands by itſelf, its name and power is one; when it is cloſe to, or belongs to another figure, it loſes its name, yet retains ſomething relative to its power, by leſſening or increaſing that other figure by one; and both together concur to ſignify but one word or number, vulgarly expreſſed by the ſingle figure of 4 or 6.

To apply this to ſhort-hand; let the ſame character |, being our letter *t*, have alſo its three diſtinct powers, *viz.*

Firſt, When it ſtands by itſelf, let it expreſs the commoneſt word or particle in our language the initial conſonant of which is a *t*: let the name therefore of this character, for inſtance, be *the*; a word which we have ſuch perpetual occaſion to write.

Secondly, When it is placed cloſe before any other characters, let it ſtand for the commoneſt prepoſition, or leading part of a word, that begins with the ſame conſonant; which in this caſe will be *trans*.

And thirdly, When cloſe at the end of other marks, let it ſignify the commoneſt ending or termination, of which the firſt (or only) conſonant likewiſe is *t*, viz. *ity*.

From this eaſy and regular aſſignment of a threefold power or ſignification to a conſonant, a threefold advantage naturally follows. 1ſt, By allotting to every mark ſtanding by itſelf, a name, *viz.* that of the commoneſt word or particle of which it is the firſt, we ſhall have a number of words, one or other of them perpetually occurring, diſpatched by the ſingle characters of the alphabet, which otherwiſe, when ſingle, would ſtand for nothing.

2dly, The prepoſitional part of a word being deſcribed by its leading conſonant in cloſe ſituation, but unjoined to the following part of it, ſecures alike the beauty and the brevity of the characters in many caſes wherein it could not otherwiſe be maintained; and alſo renders arbitrary marks needleſs and ſuperfluous: there being no ſort of occaſion for complicated crotchets where the ſimple letter determines preciſely enough the prepoſition wanted.

3dly, As it does likewiſe the termination, by its near approach to the end of characters; when, by the mutual help of each other, they deſcribe a word ſufficiently to diſtinguiſh it from all others.

Thus, in the inſtance here alluded to, the ſame ſtraight lines, and the ſame ſituation of them, by which four different numbers are expreſſed in numeral ſhort-hand, are thoſe by which we ſhould, in literal ſhort-hand, expreſs occaſionally four ſuch words as the letters and ſimilar uſe of them juſt hinted at would deſcribe, *viz.* in the numeral I *one*, V *five*, IV *four*, VI *ſix*; in the literal I *the*, V *ſr*, IV *tranſfr*, VI *frity*.

For though the initial and final power of a conſonant could not, indeed, be expreſſed in this manner by a bad alphabet, and a piecemeal huddling of its characters up and down, to denote the vowel's places; yet, in a well contrived one, where conſonants of ſhorter words fall eaſily, by one continued ſtroke, into each other, a break in thoſe of longer ones may be ſo deſcriptive of their initial or final ſyllables, as often to expreſs the whole with a conciſeneſs which many ſhorter words may not admit of. Every conſonant, then, may denote, according to its ſingle, previous, or final ſituation, a common word, prepoſition, or termination.

But the horizontal ſtraight line may be made from the top, middle, or bottom of the ſaid horizontal ſpace, that is, from the place of *a*, *i*, or *u*: ſince, then, theſe vowels before an *s* make the three common words *as*, *is*, *us*, it may as well ſtand for them all, in their ſeveral places, after this manner, *as*, *is*, *us*. N° 10.

Trans is the only common prepoſition beginning with *t*: but there are three common ones that begin with *s*, viz. *ſuper*, *circum*, (or, as we ſhould write it according to nature, *ſircum*) and *ſub*, which the horizontal ſtraight line may alſo ſtand for, at the top, middle, and bottom of the line; *circum* in the middle, becauſe of its firſt vowel *i*: but if, for the like reaſon, *ſuper* and *ſub* were both written at the bottom, it might occaſion an ambiguity; therefore we make *ſuper* over *circum*, and *ſub* under it, becauſe (in Latin) they ſignify *over* and *under*.

Again, the commoneſt termination in our language is *ſion* or *tion*; in pronunciation, *ſhon*. There are a thouſand words, all in general borrowed from the Latin, which end in this manner, the greateſt part of them of common uſe. Now let the letter *s* be drawn near to the end of any of theſe words, from the place of the vowel preceding the *ſion* or *tion*, and it will ſerve for any three final ſyllables whatever of the numerous words that afford this termination.

A few inſtances may ſuffice; as, *oration*, *repletion*, *attrition*, *promotion*, *effuſion*, N° 11. Alſo, when one or more conſonants intervene between the vowel and termination *tion* or *ſion*, they are, by the rule, to be expreſſed by the *s*, drawn from the vowel's place; as, *attraction*, *attention*, *affliction*, *adoption*, *eruption*, N° 12.

All the reſt of the conſonants are to be conſidered in the ſame threefold light, *viz.* as ſtanding by themſelves, as placed cloſe before, or cloſe after other marks; and muſt, accordingly, have a power of denoting ſome common word, prepoſition, or termination, in which that conſonant is found. This is the general rule; but in practice there are few prepoſitions and terminations neceſſary or uſeful beſides thoſe ſet down in the alphabetical table. This rule is very convenient in ſome caſes; as where the conſonants of which the word is compoſed join not well together, or cannot be kept within the parallels; for inſtance, in *behold*, *inhabit*, *depoſit*, N° 13. and affords a great contraction in others, as *underwritten*, *diſtinction*, *direction*, N° 14. But here it is to be obſerved, that, in placing the termination, regard is

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is to be had to the vowel's place with reſpect to the line, and not to its place after the laſt conſonant, (except that happens to be one or other of the three horizontal characters *s*, *k*, or *q*,) as in the above word *direction:* the *s* is drawn from the *e*'s place in the line, but it is in the *o*'s place with reſpect to the laſt conſonant *r*, which appears evidently to have begun at the bottom of the line. But when *s*, *k*, or *q*, immediately precede the termination, regard is then to be had to the vowel's place after the letter, as *aſſumption*, *aſſertion*, (N° 15. firſt and ſecond examples.) The plural number of the termination is denoted by adding a little *s*; as *verities*, *diſtinctions*, (*ibid.* third and fourth examples.)

Before the learner begins to write by the preceding alphabet, it may not be improper to premiſe a few obſervations upon the form and reſpective proportion of the letters, and the ways of joining the curved ones with the moſt eaſe and elegance.

Firſt, All the perpendicular and inclined letters (that is, all the letters except *s*, *k q*. *m*, *n*, *ch*, and *g*,) are made to touch two parallel lines, the diſtance of which is meaſured by the perpendicular ſtraight line *t*, as in N° 16.; but, however, theſe letters are ſometimes, for greater convenience, made of half ſize, and two of them included between the parallels, as in the ſeventh and eighth examples, N° 16.

The letters *m*, *n*, *ch*, and *g*, are ſemicircles; the diameter of which is the *s*, and their radius or height is rather more than one third part of the *t*.

The letters formed from the three ſtraight lines *t*, *r*, and *f*, are ſegments of larger circles, whoſe chords are the letters *t*, *r*, and *f*, reſpectively.

It muſt be obſerved, however, that it is not neceſſary, nor indeed ſcarce poſſible, that theſe proportions ſhould be exactly kept, eſpecially in quick writing; but they are given here, becauſe the nearer they are kept to, the more beautiful the writing appears.

Secondly, When *m* and *n* are joined together, they are not each of them to be made complete; but a part is to be cut off from each of them; and in the ſame manner the inclined letters, when joined with *m* or *n*, are not made complete, but, running into one another, loſe each a part, as N° 17. So the reſt of the curve line letters, when joined together, are made to run into one another ſmoothly, avoiding, by this means, that ſtopping of the pen which the making of any angle neceſſarily occaſions; as for inſtance *mp* is not written, as in the firſt example N° 18. but as in the ſecond, part of the curved line being in common both to the *m* and *p*.

Thirdly, The twirl is always made at the beginning, never at the end of any letter; whenever, therefore, the ſix laſt characters (N° 18.) occur, they muſt be ſuppoſed to have been begun from the bottom of the line.—The general rule is, That all perpendicular and inclined letters are to be begun from the top, and drawn downwards; but in all inſtances, in which the inclined letters (N° 19.) will join better with the preceding or following marks if drawn upwards, they muſt be drawn in that direction, as in theſe words, N° 20.

Fourthly, The initial or final vowels (the *e* mute excepted) are generally expreſſed, and the middle ones omitted, except in caſes where there are many words conſiſting of the ſame conſonants which might be liable to be taken for one another. But all words which have one conſonant only (except thoſe in the table of the alphabet, which are expreſſed by the letter alone) muſt always have the proper vowel point expreſſed, as *by*, *to*, &c. becauſe theſe little words are, as it were, the keys of the ſentences in which they are found.

Fifthly, Few monoſyllables beginning with a vowel are immediately followed with either *h* or *w*; for which reaſon, theſe characters, having a point before them, denote *ht* and *wt* reſpectively, with the proper vowel between them; as *hat*, *het*, *hit*, *hot*, *hut*, and *wat*, *wet*. *wit*, *wot*, *wut*, N° 21.

Sixthly, As the horizontal letters *s*, *k*, *q*. and the curved ones *m*, *n*, *ch*, and *g*, may be written at the top or bottom, or any part of the line, the vowel following them may be expreſſed by their ſituation between the parallels; as *ſan*, *ſun*, *man*, *mun* N° 22.

Seventhly, The firſt mark for the *th* in the table, not joining well with the mark for *r*. which, however, is very frequently combined with it; and the other *th*. being by reaſon of our cuſtomary method of leaning the letters the contrary way in common writing, not ſo readily made; *t* may be put for *th*, when the adjoining letter is of half ſize only, as *thr*, *rth*, *thm*, *thn*, *ths*, N° 23 In other caſes, a letter of half-ſize ſignifies that the adjoining one is to be reſolved into two letters, as *trr*, in the firſt example N° 24; for here the *r* being twice as long in proportion to the *t* as it ought to have been had only one *r* been deſigned, ſhows, that in this caſe the *r* of double length denotes *rr*: but, in the ſecond example, the laſt character does not ſignify *ll*; for it cannot be reſolved into *ll*; but it may into *lſ*; for if you divide the laſt character into two halves, the lower is our mark for *f*: in like manner, the third example is *ſt*.—When there is no other conſonant to be joined to the inclined letters *f* or *r*, the lengthening of them by a greater inclination than uſual denotes that they are to be reſolved into two letters *rr*, *ff*, or *vv*, *ſv*, or *vſ*; as in the three firſt examples, N° 25. *error*, *ſive*, *ſeoffee*: but when two *t*'s form a word, as for example the word *taught*, or, as we ſhould ſpell it, *taut*. this expedient cannot be uſed, without going either above or below the line, which is not to be done upon any account whatſoever. In this caſe a little break muſt be made in the *t*, to ſhow that there are two *t*'s; N° 25. This muſt be confeſſed to be not altogether regular, and conformable to our rules of joining the letters; and, had many inſtances occurred, their frequency would have furniſhed a juſt objection againſt our alphabet; but on the contrary, the repetition of the *t* forming fewer words than that of the other conſonants, was one reaſon of appropriating the perpendicular line to the *t* the word *taught* being the only one that often occurs in practice.

Eighthly, In ſome few inſtances, where a letter joins not well with the preceding one, as the *g* with any drawn downwards; the *ch* with any upwards; and the *j* with neither; we ſcruple not to borrow the oppoſite one, or ſome other of nearly the ſame ſound, in its ſtead; writing, inſtead of *voyage*, *voyach*; *fikure*, for *figure*; *churſh*, for *church*; *macheſty*, for *majeſty*; N° 26. And when *n* happens to be at the bottom of the line and is followed by *d*; for the ſake of eaſy joining, we write *p* inſtead of the *d*, as in the firſt example N° 27. *ſnp* for *ſnd*; and few words in our language ending in *np*, this can cauſe little ambiguity.

Ninthly, *Cm* and *cn* occurring very frequently, for the ſake of diſpatch we ſhorten the marks for *k* and *q*, when followed by *m* or *n*, as in the third and fifth examples,

N° 27.

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N° 27. Theſe cannot be miſtaken for *ch* and *g*, the twirl being on the contrary ſide.

Tenthly, The firſt mark, N° 28. placed cloſe after a word, denotes, that there is one ſyllable ſtill wanting to complete the word; and *ing* being a very common final ſyllable, it is often ſo denoted; as, *being*, *writing*, No. 28.

Eleventhly, A point ſtanding by itſelf has a power, as well as the conſonant marks, of repreſenting a common word. At the top of the line, it ſignifies the particle *a*; as, *a man:* in the middle *I*, or *eye*; as, *I will*, *his eye:* in the *o*'s place *o*; as, *O Lord:* at the bottom *you*; as, *you will*. N° 29.

Twelfthly, The common way of writing numbers being very compendious, we generally uſe it when numbers occur. The comma, as it does not reſemble any of our ſhort-hand marks, may always be uſed; but when a full ſtop is thought neceſſary, the ſmall circle after the examples, No. 29. may be uſed inſtead of the point.

To theſe rules it may be proper to add a few obſervations. In writing words (as before obſerved) we join all the conſonants, that are wanted, together; to which, if they ſuffice to diſtinguiſh a word, it is needleſs to add any of its vowels. As for inſtance, to write the word *ſtriſe*, we join the four conſonants of which it is compoſed into one continued mark or figure compriſed within the due limits, as in N° 30. firſt example: for if, without regarding the limits, we ſhould make it as in example ſecond, the letters would be the ſame indeed but the direction in this, and all ſimilar caſes, is evidently more incommodious. When, therefore, there are different ways of joining the ſame letters together, we muſt accuſtom ourſelves to the beſt, or moſt lineal. The ſameneſs of the entire figure, as well as that of its compoſing letters, is worth the writer's while to maintain; and alſo facilitates mutual reading between the fellow-practiſers of the ſame method There is a kind of mechaniſm in the caſe, by which the attention, being leſs fatigued with any deviations of unuſual appearance, eaſily apprehends the meaning of that which is more conformable to a ſtandard.

Though the letters *ſtrſ* are abundantly deſcriptive of the word *ſtriſe*; yet if any one pleaſes, he may add the point for the vowel *i*, (as in the example, N° 30.) to ſuggeſt the word to him at firſt, until he can read it readily without that aſſiſtance.

In ſingle words, the chief difficulty is, to unlearn the unnatural and perplexed method of ſpelling to which we have been long habituated. In this word *practice*, for example, the conſonant *c* is pronounced as *k* in the firſt ſyllable, and as *ſ* in the ſecond, and the vowel *e* has no pronunciation at all. But, being uſed to theſe difficulties, it is now become one to know the word by its true and genuine ſpelling according to our ſhort-hand alphabet, viz. *praktis*.

It may highly perplex a careleſs writer of new characters, to decypher the true ſenſe thereof; though it ſhould be eaſy enough to know it, by a little application and practice. But what child would not ſooner learn to read this ſame ſentence, if, after being taught the uſe of his alphabet, he ſhould have it thus written?—*It ma hili perpleks a karles riter of nu ka rakters, to deſifer the tru ſens thereof; tho it ſhud be eſi enuf to kno it, bi a litl aplikaſhon and praktis.*

Inſtead, therefore, of ſcrupling to return from ſuch cuſtomary rules as children are firſt initiated in, to a more juſt and alphabetical way of writing ſhort-hand, men may eaſily be taught, when ripened into ſome acquaintance with their mother-tongue, to reverſe the liberties perpetually taken in long-hand, that is, inſtead of employing more letters than are preciſely neceſſary to expreſs the ſound of words, they may make uſe of fewer, not only diſmiſſing ſuch as are needleſs to the ſound, but ſuch alſo as may be omitted, and yet leave the ſenſe of the words eaſily diſcoverable. If they can tell what is wanting, it is all one as if it was there; the leſs expreſſion there is, ſo much the better for the purpoſes of brevity, which juſtifies the greateſt omiſſions, provided what is left be intelligible.

And though the omiſſion of the vowels in the middle of words may, for a while at the firſt, make it difficult for a learner to read even his own writing without heſitation; yet that difficulty will certainly vaniſh, in proportion as the ſhort hand marks become familiar to him, as it ariſes, not ſo much from that omiſſion, as from the ſtrange and unuſual appearances which the characters make to his eye, and which, for that reaſon, do not ſuggeſt to him the conſonants, for which they ſtand, ſo immediately, but that the attention of the mind is neceſſarily taken up in recollecting them one by one; whereas, did they appear ſo familiar and well known to him as all to be apprehended in one view, he would ſoon diſcover the word, though all the middle vowels were left out. If any one doubts this, he may ſoon convince himſelf, by writing in the common long-hand exactly the ſame letters which he had written before in the ſhort-hand characters; and if he can read it with eaſe when ſo tranſcribed, he may be certain that a little cuſtom will make the reading of ſhort-hand every whit as eaſy to him.

And now, the way being ſufficiently cleared before him, the learner, after he has, by repeated trials, acquired a facility of forming, with tolerable exactneſs, all the letters of the alphabet ſeparately, and of remembering what particular conſonant each of them repreſents, may proceed to join two or three of the marks together; writing at firſt only ſhort words, and frequently trying different ways of joining the marks, in order to diſcover the beſt, and moſt elegant. Several of them being formed almoſt as eaſily upwards as downwards, he will find it convenient ſometimes to begin from the top, ſometimes from the bottom of the line, according to the nature of the mark which follows; and when two marks, which admit of being written downwards only, come together, the line muſt be divided between them, making each of them half the uſual depth, as in examples firſt and ſecond, N° 31. and, in ſome very rare inſtances, he will be forced to make them three deep, as *ſtupid*, (example third;) except he chuſes to make uſe of the expedient of borrowing the *b*, a letter not very different in ſound, writing *ſtubid* for *ſtupid*, as in the fourth example.

That the learner may proceed with the greater eaſe and certainty, we have given ſpecimens of writing according to the above rules, (Plates CLI, CLII.) for his imitation. He ought to make himſelf fully maſter of the firſt ſpecimen, by reading and copying it over and over with great care, until it becomes quite natural and familiar to him, before he proceeds to the ſecond; and he ought in the ſame manner to make himſelf throughly acquainted with the ſecond, before he proceeds to the third Thus moving with ſlow, but ſure ſteps, he will in a very few days find, that every difficulty has diſappeared, and that nothing remains but to practiſe till the habit is acquired. If he has the curioſity to compare the number of ſtrokes and dotts in his firſt ſpeci-

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men in ſhort-hand, which is the Lord's prayer, with thoſe uſed when it is wrote in the common way, he will find, that the former contains only about 150, while the latter contains near ſix times that number; which ſhews how much time and labour may be ſaved, even by the few ſimple rules already given.

PART II.

AN alphabet formed upon the moſt juſt and natural plan, by which, with the help of a few general rules, all the words of the language to which it is particularly adapted, may be eaſily, neatly, and ſpeedily written, will not be ſufficient to ſatisfy the expectations of an inquiſitive reader; who muſt be ſenſible, that however complete the alphabet may be, yet many compendious applications of it may be obtained by a proper inquiry into the nature of our language, and the abbreviations which it admits of. He will not be ſatisfied with being taught only how to expreſs all the letters of a word by the ſhorteſt and eaſieſt ſtrokes, but will alſo require further inſtruction how to deſcribe intelligibly words and ſentences by as few of thoſe ſtrokes as poſſible. To inveſtigate, from a few things given, many which are omitted, will be found no unpleaſant nor unprofitable exerciſe of the learner's ſagacity; and if the few be properly given, the ſenſe of the paſſage, and a due attention to the idiom of our language, will render the diſcovery of the omiſſions more certain, and alſo leſs difficult, than the unexperienced can eaſily imagine.—Without ſome ſuch rules of abbreviation, one end of ſhort-hand, that of following a ſpeaker, would ſcarcely be attainable.

Before the invention of the art of printing, the tediouſneſs of writing all the words at full length put the copiers of books upon forming many ways of abbreviating them, as appears in all manuſcripts. In thoſe of the New Teſtament we find many principal words deſcribed by their initial and final letters only, with a daſh over them. In Latin manuſcripts, thoſe terminations, by which the relations of words to one another are in that language uſually expreſſed, were generally omitted: nor was there any need of writing them at length; for the principal word being given, of which the reſt were governed in caſe, gender, and number, any reader who underſtood that language could eaſily ſupply thoſe omiſſions. Our language, generally expreſſing thoſe relations by little particles, does not indeed afford that particular mode of abbreviation. Upon a careful examination, however, it will be found capable of furniſhing many others as uſeful and extenſive.

But it will be proper, before we proceed further in this art of abbreviation, to adverтiſe the learner, who is apt to be too eager to puſh forward, not to embarraſs himſelf with it, till, by a competent practice of writing according to the rules laid down in the firſt part, he is become ſo well acquainted with the characters, as to be able to write and read them with as much eaſe as his own common hand. The beſt way to learn any art is to proceed by degrees, not venturing upon a ſecond ſtep before the firſt is perfectly maſtered. And it is evident, that this method of proceeding is, on this occaſion, particularly neceſſary: for though, in many ſentences, the ſenſe, and the particular conſtruction of the words, may plainly enough point out ſuch of them, as are deſcribed with unuſual brevity; yet how ſhall an unpractiſed learner, unable to embrace in one view the words denoted by the preceding and following marks, determine what the intermediate contracted ones muſt needs be? But, if he will have patience to abſtain from this ſecond part, until he can write readily, and read without heſitation whatever is written, according to the rules of the firſt, he may reſt aſſured that he will meet with little more difficulty in reading words contracted than he did in thoſe written more at length, provided that the rules of abbreviation be duly attended to. But, if the reader expects that we are to give him every particular manner of abbreviation which can poſſibly be invented, he will be diſappointed. The principal and moſt uſeful rules are given; and it is left to the ſagacity of the practiſer, by obſerving the nature of theſe, and proceeding upon the ſame principles, to make ſuch further advances as his occaſions may require. It would be vain to pretend to have exhauſted a ſubject which is as extenſive as the language itſelf in which we write; and conſequently may be carried further and further by every one, in proportion to his ſkill in the language, and his knowledge of the ſubject treated upon.

The learner has been already taught how to write all the conſonants of any word by one continued mark, thoſe words only excepted which may be more briefly deſcribed by the help of prepoſitions and terminations. He may now advance a ſtep further, and join together ſuch ſhort words as are either repreſented by the letters of the alphabet alone; or ſuch as, by their frequent occurrence, are become ſo familiar, as to be readily known, though denoted by their firſt conſonants only. This will be found a greater ſaving of time than can eaſily be imagined; and muſt therefore, when diſpatch is required, be done in all inſtances in which they may be joined neatly and without ambiguity.

RULE I. The different times and modes of the verbs are generally expreſſed, in the Engliſh language, by the help of other verbs, for that reaſon called auxiliary; as, *will, ſhall, have, had, can, could, may, muſt, be*, &c. Theſe muſt, upon that account, occur very frequently; and, being ſignified by their firſt conſonant, they may be joined to one another; as, *can be, will be, have* or *has been, to be, ought to be, muſt be*, Plate CLIII. N° 1. and when the negative particle *not* intervenes, it may be denoted by its firſt conſonant, and be joined with them; as, *cannot be*, N° 2. *will not be, have not been, not to be, ought not to be*, N° 3. When theſe joinings are, by a little practice, become eaſy to the learner, he may proceed further, and join the preceding pronouns to theſe auxiliary verbs; as, *he muſt be, he cannot be*, N° 4. This can occaſion no ambiguity: for though he was taught in his alphabet, that theſe two marks (N° 5.) denoted, the former *have*, and the latter *had*; yet, when placed immediately before *muſt* and *can*, their ſituation ſhows that they cannot, in that caſe, ſignify *have* and *had*, thoſe auxiliaries never admitting of ſuch an arrangement. And further, as *w* and *h* are often dropt in common ſpeech and writing, as *he'll* for *he will*, *we've* for *we have*; ſo they may, for the ſake of joining, be omitted in ſhort-hand; as, *be will, be will not be, they have been*. N° 6.

RULE II. The learner was taught in the firſt part, That in

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A Table containing the Alphabet, the common words which the letters stand for, the Prepositions and Terminations.

		Names	Prepositions	Terminations
	b	be but	be	l or able
	d	and	de or dis	de
	fv	of	for	ify
	g	against		
	h	have had		
	j	Judge Just		
	k	can / could	con or com	ical
	l	all		
	m	amongst	mis	ment
	n	an / in / under	ante or an / inter or in / under	ness
	p	upon	pre per pro	
	q	question		
	r	or	re	ary
	s / z	as / is / us	super / circum / sub	a e i o u tion or sion
	t	the	trans	ity
	w	will would	with	ward
	x	except exercise	ex or extra	
	y	yet		
	ch	which		
	sh	shall should		ship
	th	that		
at / ta	a e i o u	a / I eye / o owe / you		

as / sa — am &c. — ma &c. — an &c. — na &c.

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in writing all the conſonants of which any word was compoſed, the beginnings of the marks which follow muſt always be joined to the ends of thoſe which precede them: Whenever, therefore, they are joined in any other manner, it is to denote, that each particular mark ſignifies a whole word, and not a ſingle-letter: as for example, the particular way of joining the letters in the firſt example, N° 7. is a ſufficient indication that they were not intended to repreſent a word conſiſting of thoſe two conſonants, but two words; and the *n* in the middle of the line ſtanding for *in*, and the *t* for *the*, *in the* may be written as in that example. So again, the ſecond example, N° 7. denotes two words; and the *s* being drawn from the place of the vowel *i*, ſhows the latter of them to be *is*: and though the ſtraight perpendicular line uſually repreſents the article *the*, yet, in that ſituation, it cannot poſſibly do ſo; for that article can never come immediately before a verb, but the pronouns very frequently do. *It is* may therefore be very commodiouſly written as in that ſecond example; and *it is not to be, as it is, ſince it is*, may be written as in N° 8. and by dropping *w*, as before, we may write *it'as*, for *it was*, *it was not to be*; *it'ere to be*, for *it were to be*; *it ſeems to be*; as in N° 9. for the *s* being drawn from the place of *e*, ſhows that it muſt be either *it es——to be*, or *it se——to be*; and *it ſeems to be* is ſo very common a phraſe, that it will not give much trouble to the reader, though written in this conciſe manner.

RULE III. Points being the ſhorteſt of all marks, it would argue a great want of œconomy, as well as invention, not to make all the uſe of them that can be made conſiſtently with the regularity of our ſyſtem. The power of repreſenting prepoſitions and terminations, which was allotted to the conſonant marks, could not be given to the points: for, in that ſituation, they ſtand for the vowels; and all the diſtinguiſhable places, both before and after the conſonant marks, are already taken up by the five vowels: but a point placed directly over or under the beginning or end of any of thoſe marks, has as yet had no ſignification annexed to it. As for inſtance, in the ſecond example, N° 10. the point being ſo placed, that if the *t* was produced, it would paſs through it, is very diſtinguiſhable from all the vowels. All derivative ſubſtantives may therefore be very conveniently repreſented by making the point ſtand for the ſubſtantive derived from the word at the end of which it is placed; ſo the two examples, N° 10. ſignify *forget*, *forgetfulneſs*.—But as there are derivative adjectives and adverbs as well as ſubſtantives, it will be a great compendium to repreſent them alſo by points, diſtinguiſhable, by their ſituation, both from the ſubſtantive and the vowel points; which may be done by placing them in a line, which, if produced, would paſs through the ſubſtantive-point and would alſo be perpendicular to the laſt conſonant mark; and by making one placed before the ſubſtantive-point to ſignify the adjective, one after it to ſignify the adverb: As, *forgetful*, *forgetfulneſs*, *forgetfully*, N° 11.; *reaſonable*, *reaſonableneſs*, *reaſonably*, N° 12.; *ſufficient*, *ſufficiency*, *ſufficiently*, N° 13.

RULE IV. Although the above deſcribed mode of abbreviation is very extenſive, there being in our language a great number of long words derived from ſhort ones; yet it is far from being the only uſe which may be made of theſe adjective, ſubſtantive, and adverb points. In all diſcourſes whatever, there muſt be ſome principal words, which, either by their more particular relation to the ſubject, or frequent occurrence, will be eaſily diſcoverable, however conciſely written. If ſuch words begin with a conſonant, the firſt letter, if not the firſt vowel and conſonant, with the adjective, ſubſtantive, or adverb point annexed, will ſuggeſt them immediately; and therefore will be, though a brief, yet a ſufficient deſcription of them. As for inſtance, if the following paſſage be tranſcribed out of a diſcourſe upon the folly of worldly-mindedneſs, in common long-hand, after this manner, *Our bleſſed L——, both by his preaching and ex——, has fully ſhown us the vanity and folly of ſeeking for ſolid and laſting r—— in the poſſeſſion of any of the goods of this preſent w——*; every one muſt immediately ſee, that the words, deſcribed by their initial letters, are too plainly pointed out by the nature of the ſubject, and their accompanying epithets, to leave any room for doubt or miſtake. In following a ſpeaker, the ſame deſcription of them in ſhort-hand muſt therefore be allowed to be ſufficient. But it may not be amiſs to give another inſtance or two, with the ſhort-hand characters for the abbreviated words; as, *Life and* IMMORTALITY *are brought to light by the* GOSPEL; or again, *The* RESURRECTION *of the dead, and a future ſtate of* REWARDS *and* PUNISHMENTS, *are plainly and poſitively taught in the goſpel.* In theſe inſtances, *immortality*, *goſpel*, *reſurrection*, *rewards*, and *puniſhments*, may be wrote as in N° 14 So in writing after pleaders, who frequently uſe the expreſſion *with ſubmiſſion to your Lordſhip*, the words *ſubmiſſion* and *Lordſhip* may be wrote as in the firſt and ſecond examples, N° 15. and if the adjective *humble* be joined to *ſubmiſſion*, it may be denoted by its firſt conſonant, and be joined to the ſubſtantive; and the words *humble ſubmiſſion* may be written as in the third example. This will be found a very uſeful compendium; for there are many ſubſtantives to which ſome particular adjectives are uſually joined; as, *human nature*, *Chriſtian religion*, *natural philoſophy*, &c. Whenever, therefore, the ſubject treated of will lead to the diſcovery of the ſubſtantive, though denoted only by its firſt conſonant, it will, at the ſame time, diſcover the adjoined adjective. This method may indeed appear, at firſt ſight, to claſh with the rule about derivative ſubſtantives; but it will ſeldom happen that the two conſonants will compoſe any word from which another can be derived; or if it ſhould, it would ſcarcely ever be ſuch a one as would agree with the context.

It will appear evidently, upon a little conſideration of the nature of this mode of abbreviation, that no limits can be ſet to it; but that it may be more or leſs frequently uſed, in proportion to the knowledge, ſkill, and readineſs of the writer, which will enable him to judge in what inſtances ſuch liberties may be taken without occaſioning ambiguity. And every writer may accuſtom himſelf to mark ſuch words as moſt frequently occur in his own particular profeſſion, by the initial letters, with the ſubſtantive, adjective, and adverb points reſpectively, which, through cuſtom, will eaſily ſuggeſt thoſe words to him at firſt ſight. But it muſt not be underſtood that thoſe marks neceſſarily imply thoſe words, and no other: They may ſtand for any other beginning with the ſame letters, which the ſenſe of the paſſages requires. It cannot therefore be expected that a liſt of them ſhould be given here; but the following are ſome of thoſe which are moſt commonly uſed: as, *God*. *happineſs*, *heaven*, *Lord*, *always*, N° 16.; *altogether*, *occaſion*, *accordingly*, N° 17.; *notwithſtanding*, *opinion*, *perhaps*, *religion*,

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religion, N° 18.; *ſubject*, *together*, *world*, N° 19.

RULE V. An attention to that property of the Engliſh language, of expreſſing the different connections, and relations of one thing to another, for the moſt part, by prepoſitions, which the Greek and Latin, and ſome modern languages, do by varying the terminations of the ſubſtantives, will point out a further application of the dot to the purpoſes of abbreviation: for as, in the Latin manuſcripts, the root or body of the word being given, there was no neceſſity of writing the various terminations of the caſes, ſince any reader who underſtood that language could himſelf ſupply the particular termination which the caſe required; ſo, in Engliſh, if the two related ſubſtantives be ſuch as may be readily known, even when repreſented by their firſt conſonants only, they may be joined together, placing a dot at the point of their junction, to ſhow that they are both ſubſtantives; and the prepoſition connecting them may be omitted, for it may as certainly and as readily be ſupplied by the reader as the caſes in Latin before mentioned. This conſideration will therefore dictate the following rule, *viz.* That a dot placed at the point of concurrence of two conſonant marks, as in N° 20. denotes two ſubſtantives, of which thoſe marks are the firſt conſonants; and alſo that the latter is governed of, or connected to, the former, by ſome prepoſition which is omitted.

As for example, in this ſentence, *The ſum or ſubſtance of all the commandments is contained in the two following*, viz. *the* LOVE OF GOD, *and the love of our neighbour*: the words *love of God* may be wrote as in the laſt example: for as the particular ſituation of the dot denotes that both *L* and *G* are ſubſtantives, the article *the* before the firſt points out plainly enough the omitted prepoſition *of*; and the leaſt degree of attention to the words which precede and follow the contracted mark will diſcover that it muſt be the *love of God*.

Or again, *The* LOVE OF MONEY *is the root of all evil*; or, *Seek ye firſt the* KINGDOM OF GOD, *and his righteouſneſs*: theſe words *love of money*, and theſe other words *kingdom of God*, may be wrote as in N° 21.

The articles *a* or *the*, in this and in many of the following ways of abbreviation, may, for the ſake of joining, be omitted, as in the following ſentence, *Since the light of the goſpel has ſhone upon* the *world*, &c. the *light of the goſpel* may be written as in N° 20.

And further, though an adjective ſhould precede either of the ſubſtantives, yet they may all three be repreſented by their firſt conſonants joined together, with the dot always placed at the end of the firſt ſubſtantive. No difficulty can ever ariſe in diſtinguiſhing the adjective from the ſubſtantives. For, in the following ſentence, *The great goodneſs of God is manifeſt in all his dealings with his creatures*: if theſe words, *great goodneſs of God*, be written as in N° 22. the dot placed at the end of the ſecond mark ſhows that it muſt be the firſt ſubſtantive, the third muſt therefore denote the latter ſubſtantive, and the firſt conſequently the adjective. In like manner, in the following ſentence, *His Majeſty the King of Great Britain*, the words *King of Great Britain* may be wrote as in the firſt example, N° 23. for the dot being placed at the end of the firſt mark, it is evident that the firſt muſt be a ſubſtantive; and a little attention to the uſual arrangement of words in the Engliſh language ſuggeſts that the ſecond muſt be an adjective, as adjectives generally precede the ſubſtantives to which they are related: there is therefore as much given as if it had been written in long-hand thus, *His Majeſty, the K—— of G—— B——*; which, in a diſcourſe concerning him, would be ſufficient to diſcover that the contracted words muſt be *King of Great Britain*.

If each of the ſubſtantives have an adjective joined to them, there can be no difficulty, for the firſt and third muſt be adjectives, except in ſome rare inſtances in which the common order is ſometimes changed, and the laſt adjective is put after its ſubſtantive, as in this, *the great goodneſs of God Almighty:* in ſuch caſes, either the laſt adjective muſt be ſeparated from the reſt of the mark; or, if joined, it muſt have the adjective dot annexed; and *the great goodneſs of God Almighty* may be written as in the ſecond example, N° 23

This relation of ſubſtantives, which is expreſſed in Latin by the genitive caſe, in Engliſh by the prepoſition *of*, is by far the moſt common: but the rule is more extenſive, and ſerves to expreſs two ſubſtantives connected by any prepoſition whatſoever, as *for*, *in*, *with*, *after*, &c provided that the context, or any particular words of the ſentence, eaſily indicate not only the two ſubſtantives which are denoted by their firſt conſonants, but alſo the prepoſition which ought to be inſerted. As, for example, in this ſentence, *Happy is it for us, if, convinced by experience of the vanity of putting our truſt in man, we place all our confidence in God*, the three laſt words may be expreſſed as in the firſt example, N° 24. For the context plainly points out the two ſubſtantives; and the verb *place* marks evidently, that the omitted prepoſition cannot be *of*, but muſt be *in*.

In this ſentence, *Our holy religion abſolutely forbids all inſtances of revenge, our Saviour expreſſly commanding his diſciples to return good for evil;—good for evil* may be written as in the ſecond example: for the verb *return* ſhows plainly that it cannot be *good of evil*, but muſt be *good for evil*. It may, perhaps, be objected here, that *v* is not the firſt letter of the word *evil*; but it muſt be obſerved, that the words of the rule are, That the dot denotes two ſubſtantives, of which thoſe marks are the firſt conſonants, not the firſt letters; and a word may ſometimes be ſo pointed out by others which accompany it, as to be eaſily diſcoverable, though the initial vowel be omitted.

It may not be improper to add another example or two for the better underſtanding of this rule; as thus, *In this preſent ſtate there is no ſuch thing to be met with as pure unmixed pleaſure or pain, good or evil; here below all things are mixed, pleaſure with pain, good with evil.* The latter part of the ſentence, *pleaſure with pain, good with evil*, may be wrote as in the two firſt marks. N° 25 for the word *mixed* requiring the prepoſition *with* after it, ſhows, that it cannot be *p*—— of *p*——, *g*—— of *v*——, but muſt be *p*—— with *p*——, *g*—— with *v*——.

Or, *He is now become quite blind, he cannot even diſtinguiſh light from darkneſs*. The laſt three words may be wrote as in the third mark, N° 25.

Or again, *If we conſider, that without health we cannot enjoy any of thoſe pleaſures which riches can procure; what man, that eſtimates things according to their reality, rather than their appearance, would not prefer* HEALTH TO RICHES: or thus, *if he had it in his option, would not rather chuſe* HEALTH THAN RICHES; or, *would not chuſe* HEALTH BEFORE RICHES. The three ſeveral expreſſions will be eaſily diſtinguiſhed, though wrote all in the ſame manner, N° 26

RULE VI. The ſubſtantive point, placed before a ſingle conſonant

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conſonant mark, denotes, that the ſubſtantive repreſented by it is to be repeated, with ſome intervening prepoſition, as *after, to, by*; as for example, *day after day, time to time*, N° 27.

RULE VII. The ſubſtantive, adjective, or adverb point, placed before two or more conſonant marks joined together, denotes two or more ſubſtantives, adjectives, or adverbs reſpectively, of which thoſe marks are the firſt conſonants, and alſo that they are connected by a conjunction.

As for example, *Our bleſſed* LORD AND SAVIOUR *Jeſus Chriſt, by his* DEATH AND PASSION, *made a ſufficient* SATISFACTION AND ATONEMENT *for the ſins of the whole world;—Lord and Saviour, death and paſſion, ſatisfaction and atonement*, being wrote as in N° 28.

Or further, *The precepts both of* NATURAL AND REVEALED *religion forbid us to do our neighbours any injury*; example firſt, N° 29. Here the point ſhows, that both *n* and *r* are adjectives; and the word *religion*, to which they are connected, will immediately ſuggeſt the words *natural and revealed*.

Or, to add one other inſtance, *What doth the Lord thy God require of thee, but to live* SOBERLY, RIGHTEOUSLY, AND GODLY, *in this preſent world?* example ſecond, N° 29. Here it appears, by the prefixed point, that *s, r*, and *g*, muſt all be adverbs, and conſequently that there is nearly as much expreſſed as if the ſame ſentence had been written in long-hand after this manner, viz. *What doth the Lord thy God require of thee, but to live ſ——ly, r——ly, and g——ly in this preſent world?* which ſurely would give very little trouble to fill up with the words *ſoberly, righteouſly, and godly*.

Thus any ſeries of ſubſtantives, adjectives, or adverbs, may be expreſſed by their firſt conſonants joined together with the proper point prefixed. But we muſt not indulge ourſelves in doing this at all adventures. It is only to be done in ſuch inſtances, wherein the commonneſs of the phraſe, or the nature of the ſubject, points out the words ſignified by thoſe letters; or when the words, ſo briefly deſcribed, are ſuch, that no other can be inſerted in their ſtead conſiſtently with the ſenſe of the paſſage.

When great diſpatch is required, as in the caſe of following a ſpeaker, all omiſſions are allowable, which can afterwards be ſupplied by a careful attention to the idiom of the language, and to the connection of the contracted words with thoſe which precede or follow them. And it may not be improper to obſerve, that greater or leſs liberties of contracting may be taken, in proportion as the ſpeaker is more or leſs accurate in his language. For it is certain, that any contractions, where the ſtyle is clear and regular, may be more eaſily decyphered, than where it is confuſed and embarraſſed. It may happen, indeed, ſometimes, that the words ſignified by ſuch contractions will not occur at firſt ſight; but a little thought will diſcover them; and the reader will find, that an attention of this ſort will very agreeably and inſenſibly lead him into a more perfect knowledge of the idiom of his own language.

RULE VIII Many long words may be, and frequently are, expreſſed in common writing by their firſt ſyllable only, with a mark to ſhew that ſomething is wanting, as *mult——* for *multitude*, *cor——* for *correſpondence*. So in ſhort-hand, long words, eſpecially thoſe in which the marks for the conſonants will not join neatly, may be denoted by their firſt ſyllable, with as many points annexed as there are ſyllables wanting; as, *multitude, correſpondence* *, N° 30. And when great diſpatch is required, the points may be omitted, eſpecially if the words do not begin with prepoſitions; as, *ſignification, difficulty, negligence*, N° 31.

RULE IX. The power given to the conſonant-marks of repreſenting prepoſitions and terminations, will enable us to write great numbers of long words after a very exped.tious manner: for words beginning with prepoſitions may be denoted by their reſpective prepoſitions, together with the next conſonant and vowel; and oftentimes with the next conſonant only, adding to it the ſubſtantive, adjective, or adverb point, when neceſſary. As for inſtance, the firſt example, N° 32. expreſſes a word beginning with the two ſyllables *de-li*; and though there are many words which begin with thoſe ſyllables, as *deliberate, deliver, delicious*, &c. yet if ſuch a ſentence as the following were to be written thus, *He was not haſty in his reſolution, but took time to deli—— about it*, the word *deliberate* would immediately occur to every one.

The trouble of inſerting the vowel may, in many inſtances, be ſaved, by beginning the conſonant from that point after the prepoſition in which that vowel ſhould be placed; as in example ſecond, N° 32. the *m* beginning from the *u*'s place after the *t* ſhows, that the next vowel after *m* is *u*; and the mark therefore is equivalent to *tranſmu——*, which is a ſufficient deſcription of the word *tranſmutation*.

A few examples more will ſufficiently explain this rule: as, *recommend, recommendation, recommendatory*, N° 33. *reſignation, reſolution, conſanguinity*, N° 34. *conveniently, ſuperficially*, N° 35.

The participles may be abbreviated after the ſame manner, by adding, inſtead of the points, the termination *ing* or *ed* to the latter conſonant mark; as *conſi——ing* for *conſidering*, *conſi——ed* for *conſidered*, N° 36.

Words beginning with double or treble propoſitions may be written after the ſame manner; as, *miſinformation, repreſentation, miſrepreſentation*, N° 37. *incomprehenſibility*, example firſt, N° 38. The prepoſitions muſt always be joined to-ther; and, if two conſonants begin the next ſyllable, the writing of them both will help to diſcover the remainder of the word; as *miſunderſtanding*, example ſecond, N° 38.

It muſt appear plainly to every one, upon the leaſt conſideration, that the words in the foregoing inſtances are abbreviated. There can therefore be no danger of miſtaking, for example, the mark N° 39. for ſome ſhort word, ſuch as *daily, duly*, &c. For, by our rule, the *d* disjoined always ſignifies the prepoſition *de:* nor can it be a word conſiſting of the prepoſition *de* and the ſyllable *li* or *ly* only; for, if ſuch a word had occurred, it would have been ſooner written by joining the marks together, as N° 40. This way of writing therefore ſhows, that the word begins with the prepoſition *de*; that the next ſyllable is *li*; and that there are ſome other ſyllable, or ſyllables, wanting to complete it. Nor can the conſonants in thoſe examples in which the vowels were omitted, be miſtaken for terminations; as in this example, N° 41. the *k* cannot be ſuppoſed to repreſent the termination *ical*; ſince it would be abſurd to think of deſcribing any word by its prepoſition and termination only: for as the

* When one ſyllable only is wanting, a point cannot be uſed to expreſs it; for a point ſo placed muſt denote a vowel.

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ſame prepoſition and termination are common to great numbers of words, they alone can never give a good deſcription of any particular one.

This way of reaſoning purſued will lead to the diſcovery of an eaſy and ſhort method of denoting the words *ſelf* and *ſelves*, which ſo frequently follow the pronouns. For, if a disjoined mark loſes its power of repreſenting a termination, by being placed cloſe after a prepoſition, the — muſt certainly loſe that of repreſentiong *ſion* or *tion*, when placed cloſe after any of the pronouns, ſince they never admit of ſuch a termination. It muſt therefore, in that ſituation, denote only the conſonant *s* followed by that vowel from whoſe place in the line it is drawn; and conſequently the words *ſelf* and *ſelves* may be very commodiouſly repreſented by drawing the *s* from the *e*'s place, cloſe after any of the pronouns; as, *myſelf, itſelf, ourſelves, themſelves*, &c. N° 42. And though the word *own* ſhould intervene, yet *ſelf* or *ſelves* may ſtill be ſignified in the ſame manner; as, *my own ſelf, his own ſelf*, &c. N° 43.

The words *what, who, whom, how*, &c. have very often the word *ſoever* added to them, which may, for a reaſon ſimilar to the foregoing, be very aptly expreſſed by the *s* drawn from the place of *o*; as *whatſoever, howſoever, whomſoever*, &c. N° 44.

Rule X. In like manner, words ending in any of the terminations marked in the preceding table of the alphabet, may be denoted by their firſt conſonant and vowel, together with the proper mark for its termination; as for example, *ar——ry* for *arbitrary*, *op——ity* for *opportunity*, *cu——ity* for *curioſity*, *lawfulneſs*, N° 45.

But it muſt be carefully obſerved, that the vowel, whether it precedes or follows the conſonant, muſt never be omitted; otherwiſe the conſonant might be taken for a prepoſition, and then this rule would interfere with the foregoing: whereas its power of repreſenting a prepoſition is deſtroyed by the addition of the vowel, whilſt the ſingle diſjoined mark, at the end, retains its power of repreſenting a termination. The word is therefore deſcribed by its beginning and termination, a vacancy being left in the middle to be ſupplied by the ſagacity of the reader.

Rule XI. It cannot have eſcaped the obſervation of any one who has conſidered the Engliſh language with any degree of attention, that words of different ſignifications govern, or require different prepoſitions; that words, for example, ſignifying *deſire, knowledge, ignorance*, &c. require the prepoſition *of*; that other words, importing *mercy, compaſſion, dependence*, &c. require the prepoſition *upon*, &c. Care therefore being taken to write the prepoſitions plainly, the firſt conſonant only will in many inſtances be found to be ſufficiently deſcriptive of the words which require thoſe particular prepoſitions. For although there may be many words which begin with the ſame conſonant; yet all thoſe which do not require that particular prepoſition, are upon that account immediately excluded; and the remainder is by that means reduced to ſo few, that it will be eaſy to ſelect the proper one. In every one of the following ſentences (and many more of the like kind might be given) the letter *d* denotes a different word, *viz.* in *He was very d—— of being thought rich*; *You may d—— upon my promiſe*; *I d—— from him in opinion*; *He d—— long about the choice of a patron, but at laſt reſolved to d—— his work to*, &c &c. and yet, by the help of the diſcriminating prepoſitions, the particular word proper to each place is eaſily diſcoverable.

A few inſtances will be ſufficient to give the learner a right notion of this method of abbreviation.

For example, in the following ſentences; *This* BELONGS *to me*; *He made ſome good* OBSERVATIONS *upon it*; *I want to* DISPOSE *of my houſe*; *He* AGREED *with me in opinion*;—the words *belongs, obſervations, diſpoſe, agreed*, may be written as in N° 46. And in theſe ſentences, *There was not the leaſt* DIFFERENCE *between us*; *We muſt take particular care to* GUARD *againſt ſuch paſſions as we find ourſelves moſt* LIABLE *to*; *As for his perſonal eſtate, he* DIVIDED *it amongſt all his children in equal ſhares*;—the words *difference, guard, liable*, and *divided*, may be wrote as in N° 47.

And it may be further obſerved, that as few Engliſh words end with the ſyllable *to*, the propoſition *to* may for that reaſon be joined to the preceding word, which was directed to be ſignified by its firſt conſonant only. For the unuſualneſs of the ending will be a ſufficient hint, that the mark repreſents not one, but two words; and, therefore, *This belongs to me*, may be written as in example firſt, N° 48. and *liable to*, *ſatisfactory to*, and *ſubject to*, may be wrote as in the ſecond, third, and fourth examples, the — in this laſt inſtance being made at the bottom of the line, to ſhow that the vowel following it is *u*. But, if any one finds it difficult to write the *t* upwards, he may, whenever it is neceſſary, diſtinguiſh the two laſt inſtances from one another, by inſerting the *u*, and write *ſubject to* as in N° 49.

Other prepoſitions, which are denoted in the table of the alphabet by a ſingle conſonant, may, in like manner, be joined to the preceding word; as in the example, *He made ſome good obſervations upon it*,—*obſervations upon* may be written as in N° 50. Nor will there be any great danger of the reader's being puzzled by miſtaking ſuch like marks for ſingle words; for it will not often happen that the two conſonants of which they are compoſed will form any word, ſcarcely ever that they will form ſuch a word as will ſuit the place and agree with the context. A little cuſtom will therefore ſoon ſuggeſt to the learner, that the two marks muſt denote two words; the latter of which, being repreſented in his ſhort-hand alphabet by the latter conſonant mark, muſt for that reaſon immediately occur to him.

Rule XII. Prepoſitions generally require after them either a noun, or a pronoun. The pronouns being few in number, and in all languages uſed as ſubſtitutes for nouns, muſt occur very frequently, and by that means ſoon become familiar to the learner; the pronoun, for that reaſon, may be joined to the prepoſition, without danger of creating any difficulty to the reader.

As for example, in theſe ſentences, *He gave it to me, He left it to my, to us, to you, to our, to your*, the words *to me, to my, to us, to you, to our, to your*, may be wrote as in N° 51. The *h, th*, or *wh*, may, for the ſake of joining, be dropped in the pronouns, which begin with thoſe letters, as *his, this, whom*, &c. and we may write *to his* as in example firſt, N° 52. and *to this* as in example ſecond; diſtinguiſhing, if it ever ſhould be thought neceſſary, *his* from *this*, by the different ſituation of the point; *to her* and *to their*, as in example third: for a diſtinction between them can not be made, as was done in the inſtance before, by the different placing of the point; but the ſenſe of the paſſage will eaſily ſhow which it muſt be. *To whom, to thoſe*, or *to whoſe, to which, to each*, may be wrote as in the firſt four examples, N° 53. *It was not* IN MY *power*; *in my*, as in the

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the fifth example. *It was thrown* UNDER MY *feet, He came and dwelt* AMONGST US, *You may be d-pend* UPON ME; the words *under my, amongſt us, upon me,* as in N° 54.

This rule is not to be reſtrained to thoſe prepoſitions only which are denoted in the table of the alphabet by a ſingle conſonant, as *among, under, upon,* &c. but may be extended to others, which muſt in that caſe be repreſented by their firſt conſonant, and be joined to the pronoun; as, *he did it* WITH MY *conſent*, writing *with my* as in N° 55. This will occaſion no ambiguity, ſince *w* cannot in this place ſignify the word *will*; for ſuch a ſentence as, *he did it will my conſent*, would be neither ſenſe nor grammar. Its ſituation in the ſentence, and connection with the pronominal adjective *my*, plainly mark that it muſt be ſome prepoſition which begins with *w*.

And though ſeveral prepoſitions ſhould begin with the ſame conſonant, yet they may be written in this manner, provided that the preceding or following words be ſuch as will ſerve to diſtinguiſh them, and ſhew which of them muſt needs there be meant; as in the following examples: *He came privately and took it away* WITHOUT MY *knowledge; To ſtoop to ſo mean an action was much* BENEATH HIS *dignity; It is* BEYOND MY *reach. Without my* may be written as *with my*, N° 55. and the words *beneath his, beyond my*, as in N° 56. *Above* may be diſtinguiſhed from *beyond*, by prefixing the initial vowel. Thus, in the following ſentence, *it is* ABOVE MY *comprehenſion, above my* may be wrote as in example firſt, N° 57. and *between them, before my, behind my*, in theſe ſentences, *They divided it equally* BETWEEN THEM, *He had the impudence to do it* BEFORE MY *face, He did it ſlyly* BEHIND MY *back*, may be wrote as in the three laſt examples, N° 57.

But it is to be noted here, that when the propoſitions themſelves are abbreviated, as in theſe inſtances above, they cannot help to explain other words, as they did in thoſe mentioned in the beginning of the 11th Rule, in which they were directed to be written plainly; for it would be very puzzling indeed, if that word, which was to aſſiſt in explaining others, wanted explanation itſelf.

RULE XIII. After the learner has, by a little practice, made the laſt method of abbreviation familiar to himſelf, he may venture to combine it with the foregoing, and join the preceding word, the prepoſition, and pronoun all together: and as he had learned before to write *belongs to*, as in example firſt, N° 58. and as the laſt rule taught him to write *to me* as in example ſecond, he may now join them all together, and write *belongs to me, extends to us, agreed with me, depend upon me*, as in N° 59.; *obſervations upon this*, as in example firſt, N° 60.; and *rebellion againſt his, diſſenſions amongſt his*, as in the two following ſentences, *He was a notorious traitor and caught in actual* REBELLION AGAINST HIS *Majeſty, He was an ill natured man, and always endeavouring to ſow* DISSENSIONS AMONGST HIS *neighbours*, may be wrote as in N° 60.

When a pronoun, or a prepoſition and pronoun, follow the verb, and are themſelves followed by a prepoſition and pronominal adjective, they may all be joined together; as, *I* CONGRATULATED HIM UPON HIS, *&c. I* CONDOLED WITH HIM UPON HIS, N° 61.

The words *ſome, any, none, which, each, both*, &c. followed by a prepoſition and pronoun, may, agreeably to this rule, be denoted by their firſt conſonants, and be joined to the prepoſition and pronoun; as, *ſome of them, any of us, none of them*, N° 62. *both of them, which of them, each of them*, N° 63. The firſt dot is inſerted to diſtinguiſh the words from one another which begin with the ſame conſonant; as, *none, any*, &c. The latter dot muſt never be omitted, as it is the appointed way of writing the pronouns when joined to prepoſitions; as, *of them*, N° 64.

RULE XIV. After the learner has for ſome time accuſtomed himſelf to the foregoing rule, he may advance a ſtep further, and join the adverbs preceding the verbs, and the ſubſtantives following the pronominal adjectives, to the verbs and adjectives reſpectively, denoting both the adverbs and ſubſtantives by their firſt conſonants, or at moſt by their firſt conſonants and vowels; as for example, in this ſentence, *you may* SAFELY DEPEND UPON MY WORD, *ſafely depend upon my word* may ſtand as in N° 65. *

Difficult as this may ſeem to a beginner, yet habit, and a little reflection upon the nature of our language, will quickly render it eaſy to him. His own experience will ſoon convince him, that contractions, when judiciouſly made, may be more certainly and eaſily read than the unexperienced are apt to imagine. It may, perhaps, for a while at the firſt, be a good method to take the contractions to pieces, writing in long-hand exactly what is given in ſhort-hand. The foregoing contraction ſo tranſcribed would ſtand thus, *you may ſa—— d—— upon my w——*. Here the prepoſition *upon* will ſoon ſuggeſt, that the preceding word, beginning with the conſonant *d*, muſt be *depend*; and the word denoted by its initial letters *ſa*, coming betwixt the auxiliary *may*, and the verb *depend*, is by its ſituation, according to the uſual arrangement of words in our language, plainly enough marked to be an adverb; ſo that it is nearly the ſame as if it had been written thus, *You may ſa——ly depend upon my w——*, which is too plain a deſcription to prove a ſtumbling-block to any attentive reader.

RULE XV. Many common phraſes, formed by a ſubſtantive preceded by the prepoſitions *with, without, in*, &c. and followed by *to, of*, &c. may be very conveniently contracted; as, *with regard, reſpect, or reference to*, N° 66. example firſt. *He baſely broke his promiſe,* WITHOUT ANY REGARD TO HIS *honour*; *without any regard to his*, as in example ſecond; *in relation to*, as in the third example; *in order to, in conſequence, compariſon, or conſideration of, in obedience to your*, N° 67.; *by reaſon of his, by virtue of his*, N° 68. (in this laſt inſtance, the proportionably little *b* ſhows, that the mark following it is to be divided into two letters;) *upon account of, in the power of*, N° 69.

RULE XVI. Common adverbial phraſes are, in like manner, often denoted by their initial conſonants joined together; as, *for the future, at the ſame time, at preſent, in this manner*, N° 70.; *in like manner, in a great meaſure, in the ſame manner*, N° 71.; *in ſo much that, ſo much the more, in the mean time*, N° 72.; *in general, in particular*, N° 73.

And when the proportion of equality is expreſſed by *ſo——as*, or *as——as*, with ſome one word intervening, they may be all joined together; as, *ſo much as, as much as, as.*

* As a ſubſtantive muſt neceſſarily follow the adjective *my*, there was no occaſion to place the point at the end of the *w*, to ſhow that it was one.

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as well as, as long as, as good, or as great as, &c. N° 74.

RULE XVII. The contractions which may be made when *it is* or *it was* are followed by an adjective, and *to* or *that*, are so numerous, that we must content ourselves with giving a few of the most usual; as, *it is impossible to, it was unnecessary to, it is contrary to*, N° 75.; *it is according to, it is observable that, it is evident that, it is not to be supposed that*, &c. N° 76.

The above methods of abbreviation are such as are of most common use and practice: and though they are not many in number, yet they are very extensive in their application; for a sentence can scarce occur in which some one or other of them will not find a place. But yet we are far from pretending to have exhausted the subject. An accurate and assiduous attention to the nature and idiom of our language may suggest others as useful and extensive as these. Proper care being taken to lay a right foundation, the legible ways of contracting will increase, in proportion to the writer's want of them. The more he writes, the more concisely he may venture to write, and yet be able to read his contractions with ease; provided that he builds them upon some known particularity of our language: for which reason we have been more solicitous to explain the grounds of our rules, than curious in the choice, or copious in the number of examples. But that the learner may have all the assistance necessary, we have furnished him with specimens, (Plates CLIII. CLIV. CLV.) where he will find his rules exemplified; and as the last specimen is taken from a book not in every person's possession, we have given the passage in a note *.

But it may not be amiss, before we conclude, to make a remark or two upon abbreviations in general.—First, that in all the various ways that can be taken of contracting, (that is of describing words by some shorter method than that of writing all the consonants of which they consist,) care must be taken, when the contraction consists of two or more words joined together, that no one word of it be represented by more than one character; and secondly, that the whole mark, by some means or other, if possible, be shown to be a contraction, as it has been generally done in the foregoing pages, either by the insertion of points in the middle of the marks, as N° 77. (Plate CLIII.) for *some of them*; (which, when dispatch is required, is never practised to denote vowels in the middle of words;) or by the unusual ending of the mark, as N° 78. for *liable to, appears that*; for few words (since the termination *eth*, so frequent in scripture-language, is now almost grown obsolete) end in *th*; or by the unusual joining of the marks, as, *in the, it is*, &c. N° 7. Otherwise the reader might be puzzled in hunting for some one word-consisting of the letters which are written: whereas, if he knows it to be a contraction, he is not bewildered in his researches, but is at first directed the right road, and has nothing to do but to search after some word for every character, which will suit the description, and agree with the context.

And when contractions are judiciously made, the learner, provided he will observe the caution already given, (and which cannot be too often repeated,) of beginning with the easiest, and of not proceeding to a second, until the first is become familiar, will certainly find the difficulty of decyphering them lessen every day.

But, supposing that there was more difficulty in the reading

* PROCEEDINGS on an *Habeas Corpus* upon the commitment (by Sir *William Turnbul* Secretary of State) of *Kendale* and *Roe* for High Treason, 31 October 1695.---Sir *Bartholomew Shower*, for the prisoners, spoke as follows.

Sir *Bartholomew Shower*. I am of counsel for these two prisoners: and what we desire at present is only that they may be bailed; though perhaps we might press to have them discharged, and that upon good reason.

To induce your Lordship to bail them, I must beg your Lordship's pardon, and I hope Mr. Attorney will hold me excused, if I make a question, Whether the person committing hath any authority for such a purpose. It is for my clients, who think themselves aggrieved by this imprisonment: and in truth they say, that they are somewhat hardly dealt withal in this case; for the information against them is only for being privy to, and assisting the escape of the centinels who were privy to Sir James Montgomery's escape. But this is fact of which the court will not take notice; and therefore I shall confine myself to the return, as it appears before your Lordship.

With submission, I must insist upon it, that a secretary of state, *quatenus* secretary, cannot commit for treason or felony: he is not an officer for such a purpose in common parlance. The word *secretary* imports only a *writer of letters* or other escripts for a superior; and, as Spelman explains the word, this is the sense of it, with the addition of secrecy, of privacy: and so is his glossary upon that word. He is not a privy-counsellor, *quatenus* a secretary; nor is he a justice: and though perhaps, in fact, he may be in the commission; yet, unless he hath taken the oath of that office upon a *dedimus*, he cannot act as such: and I have seen five or six privy-counsellors at a time appearing at a sessions of the peace for this county, in the case of the Duke of Bedford's power, as *custos rotulorum*, to remove the clerk of the peace; and when intimation was made to them of the justices oath which they had not taken, they refused to vote, and did thereupon withdraw. Here Sir William Turnbull cannot be presumed or intended to be a justice of the peace; because the commitment by him is as secretary, and not as justice; and so is the return: and upon the return the authority by which he commits ought to appear, otherwise the return is vicious; and here doth appear none but that of a secretary. Now, if the office of secretary doth not imply and carry in it a power of committing, then this commitment is erroneous.

Our constitution hath distributed the administration of justice, both in criminal and civil causes, into several courts; and hath appointed several officers for several purposes; some for civil, some for criminal matters; and in criminals some are to examine and commit, others to obey and carry, others to receive and keep; some to try and sentence, others to execute; each hath his proper province: and of those your Lordship will take notice, as also of their several duties and powers; and so do our law-books. But a secretary is a court-officer of state, not relating to the administration of justice.

You take notice, as do our books, of head-boroughs, constables, sheriffs, coroners, escheaters, and the like: But neither *Coke*, *Crompton*, *Fitzherbert*, *Smith*, or any book which treats of the jurisdiction of courts, the pleas of the crown, or the officers of justice, do ever mention a secretary of state: his office rather relates to foreign negotiations than domestick; and if any home-affairs fall under his cognizance, it is rather as an intelligencer than with any relation to criminals, prisons, or gaolers, &c. In all the debates about the liberty of the subjects, and wrongful commitments, which were in parliament in 4 *Car.* I. or 1628; and amongst all the precedents mentioned there upon each side, which are multitudes; there is none by a secretary. It is true, there are divers *per mandatum Dom. Regis*, by warrant from the Lords of the council. I have perused Dr. *Franklin*'s Annals of King James the 1st. *fol.* 261. and *Rushworth*, Vol. I. 458. and can find none by a warrant from a secretary. I have read *Coke*'s, *Selden*'s, and *Littleton*'s arguments upon that subject, but see nothing of a secretary's commitment. And it seems very strange, if such a power were lodged in this state-officer, that there should be no precedents for it in those times, when extrajudicial and general warrants were so frequent, that they became a grievance to the people, and such a one as laid the foundation for the *petition of rights*.

I shall not controvert the power of the council at present, because it doth not concern the present question: All that I can observe in the case is, that it first began to be practised in Sir Lionel Jenkyns's time; and yet, even in 1678, when the Popish plot had increased the number of prisoners to a wonderful degree, it is notoriously known, that the chief justice Scroggs was frequently and often sent for to Whitehall, to examine, and commit, and grant warrants. And sometime since the secretaries of state have thrown that burden off from themselves upon their secretaries under them, who have been sworn justices of the peace; and Mr. Bridgeman hath accordingly executed the office of a justice of peace at Whitehall, and that frequently. It hath been a question, Whether a chancellor, or keeper of the great seal, can commit; and the better opinion hath been, that he cannot: And it seems to be agreed by *Granvill*'s and other cases in *Moor*'s Reports, 839. &c. that his commitment is illegal, unless for a cause within his jurisdiction as a court of equity: and the matters must so appear. I must agree, that any man may apprehend another for felony or treason; but there is a vast difference between an arresting of a traitor or felon upon suspicion or knowledge, and a formal commitment to prison with a charge of treason. And I am sure Mr. Attorney General will not insist upon this reason; for then the consequence will be, that any man may commit, as well as a secretary: And I suppose that doctrine will scarce be allowed; though I think that any man may, as well as he. The reason of an apprehension upon suspicion, or hue and cry, or the like, is not to detain, but to carry to a constable or justice, as in 3. *inst.* 52. Then here the goaler doth not return that he detains him because he is guilty or suspected; but because, by virtue of such a warrant, he is committed to his custody.

Besides, the reason of our law is against it; for a secretary cannot administer an oath. Now the law requires, that no man should be committed by an extrajudicial warrant, unless upon oath. If there be but a suspicion, there ought to be oath of the cause of that suspicion; for the person committing cannot commit upon another's suspicion, unless there be oath of some reasonable cause for it. He cannot take bail for any person accused, he cannot take a recognizance to prosecute. And I may very well challenge any man living to shew me any one recognizance ever returned into any court, that was taken by a secretary, either for appearance of a criminal, or for the prosecution of one. And the practice is always otherwise; for they have often taken bonds to the king with condition to appear here. And your Lordship, and the court, hath often had much trouble in that matter; for, they being bound to appear here, the court hath refused to record their appearance, because no recognizance returned or taken whereupon to found such an appearance.

Now it seems strange, nay absurd, that our constitution, which we admire for its wisdom, should appoint an officer who would commit, and yet cannot give an oath whereon to found a commitment, that cannot bail, that cannot take any recognizance to prosecute: This is to make the liberty of the subject very precarious, notwithstanding the many laws and sayings of judges in favour of it, &c. STATE TRIALS, Vol. V. Page 605.

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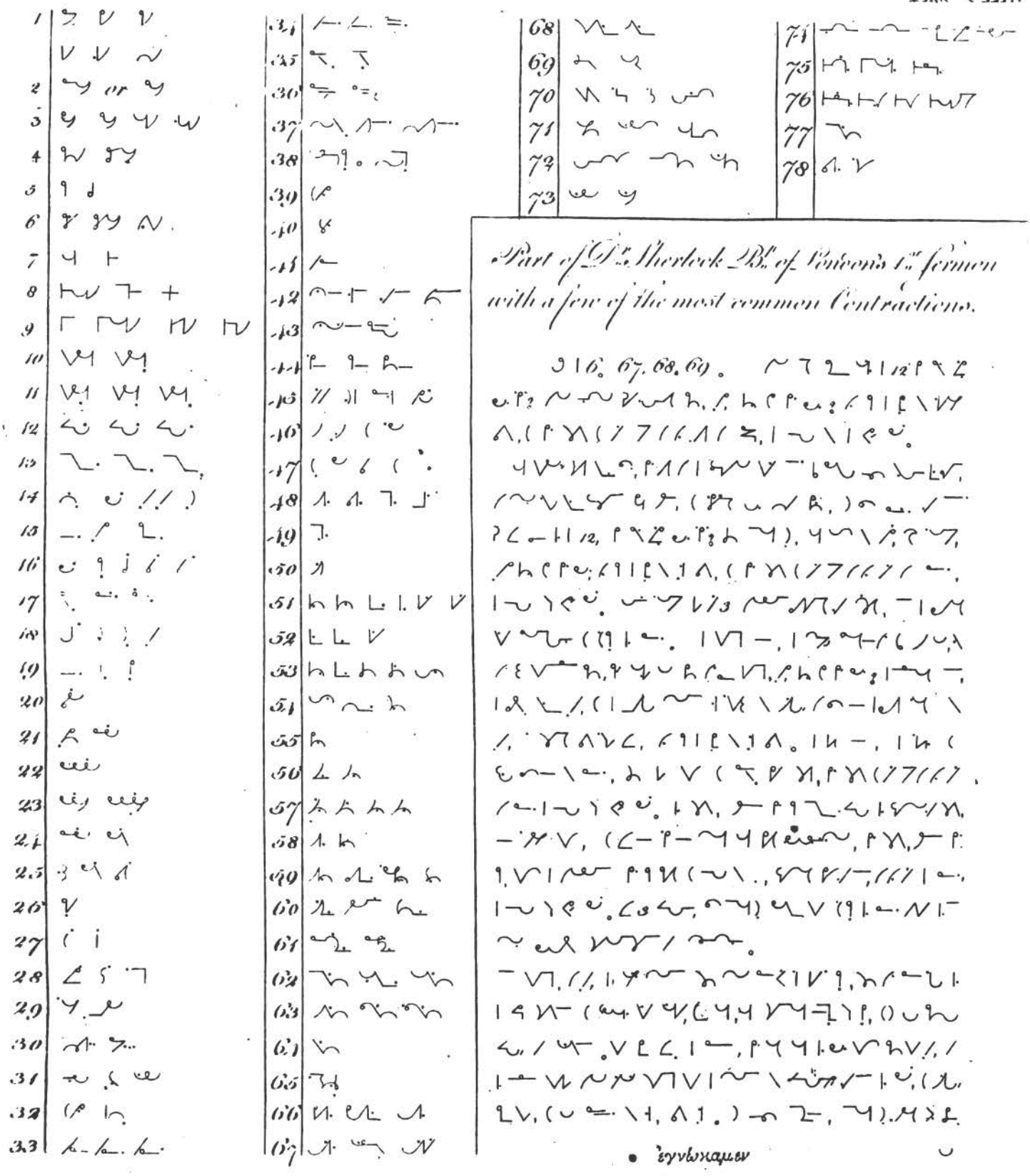

Part of Dr. Sherlock Bp. of London's 1st Sermon with a few of the most common Contractions.

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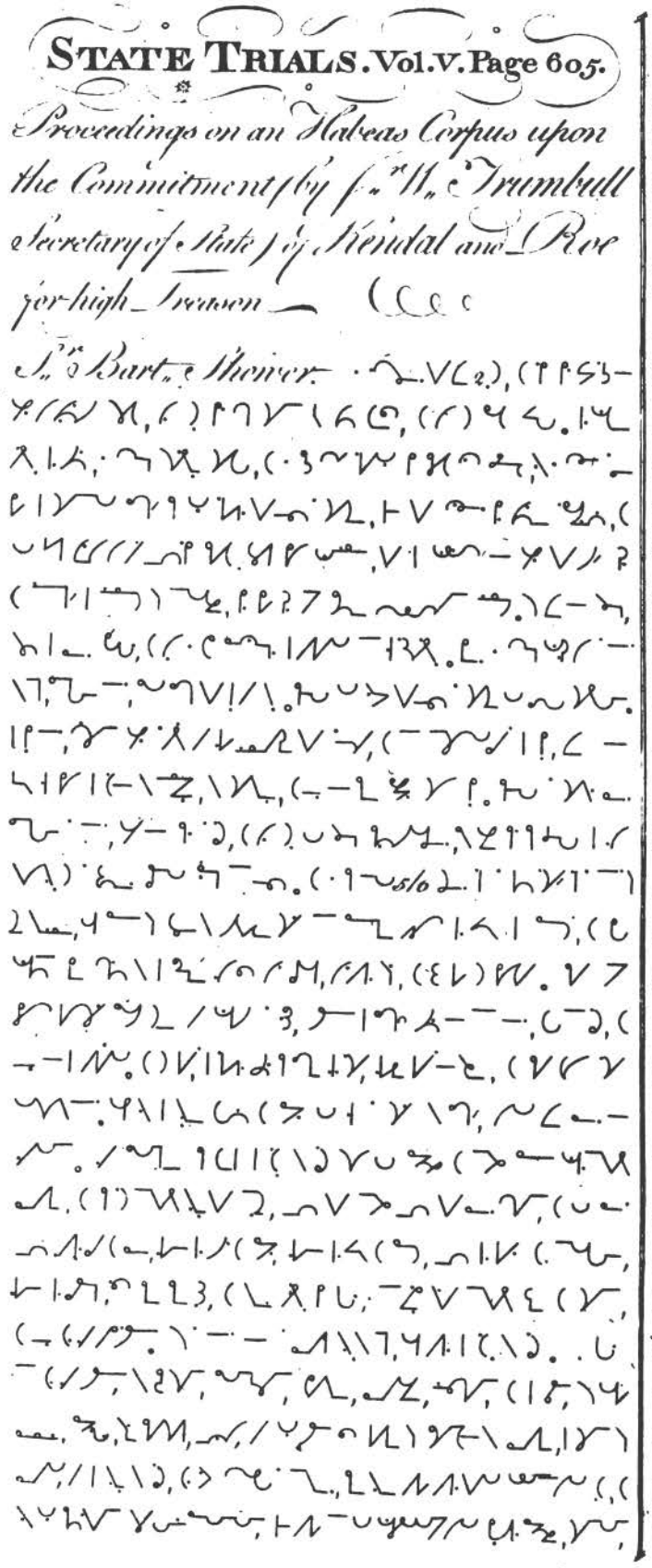
STATE TRIALS. Vol. V. Page 605.

Proceedings on an Habeas Corpus upon the Commitment (by Sr. W. Trumbull Secretary of State) of Kendal and Roe for high Treason

Sr. Bart. Shower.

A. Bell sc.



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ing of them; yet, provided that they may be certainly made out by due attention to the ſubject treated upon, and the idiom of the language, it will be ſufficient: for the learner muſt be advertiſed, that theſe contractions are not deſigned to be taught as the common ſtandard method of writing ſhort-hand upon all occaſions.—That method which was taught in the firſt part, and which will be as eaſily read, upon a little practice, as common long-hand, will be found ſufficiently ſhort for all common purpoſes; and it ſhould therefore be kept to when very great diſpatch is not required.

Inventors of ſhort-hand have generally introduced into their ſyſtems a multitude of *arbitrary* marks, to ſignify particular words and phraſes, which are often choſen rather upon account of their length than their frequent occurrence. The injudicious application of theſe arbitrary marks is not the only objection againſt them. They are not only burdenſome to the memory, and tedious and difficult to be learned, but are forgot even by the writer himſelf, unleſs he ſits down to decypher immediately whilſt every thing is freſh in his memory.

Theſe objections lie not againſt the above methods of abbreviation. They burden the memory with no new and arbitrary marks, and with but few rules for the extenſion of the powers of the alphabetical characters; and the rules are ſo general, and applicable to ſuch a multitude of caſes perpetually occurring, that they give this ſyſtem the advantage, even in point of expedition, over arbitrary marks, and at the ſame time leave the writing legible, whatever length of time intervenes, not only to the writer himſelf, but alſo to every fellow-practiſer of the ſame method.

SIA

SHOT, a denomination given to all ſorts of balls for fire-arms; thoſe for cannon being of iron, and thoſe for guns, piſtols, *&c.* of lead.

SHOVELER, in ornithology. See ANAS.

SHOULDER BONE, in anatomy. See ANATOMY, p. 175.

SHOULDER-BLADE. See ANATOMY, p. 176.

SHOWER, in meteorology, a cloud reſolved into rain. See RAIN.

SHREW MOUSE. See MUS.

SHREWSBURY, the county-town of Shropſhire, ſituated on the river Severn: W. long. 2° 46′, N. lat. 52° 46′. It ſends two members to parliament.

SHRIMP, in ichthyology. See SQUILLA.

SHRINE, in eccleſiaſtical hiſtory, a caſe or box, to hold the relics of ſome ſaint.

SHROPSHIRE, a county of England, bounded by Cheſhire on the north, by Staffordſhire on the eaſt, by Herefordſhire on the ſouth, and by Montgomeryſhire on the weſt

SHROVE TUESDAY, is the Tueſday after Quinquageſima Sunday, or the day immediately preceding the firſt of Lent; being ſo called from the Saxon word *ſhrive*, which ſignifies *to confeſs*, as having been employed by the people in time of popery, in confeſſing their ſins, in order to receive the ſacrament, and thereby qualify themſelves for a more religious obſervation of Lent.

SHROWDS, in a ſhip, are the great ropes which come down both ſides of the maſts, and are faſtened below to the chains on the ſhip's ſide, and aloft to the top of the maſt; being parcelled and ſerved in order to prevent the maſt's galling them. The top-maſt ſhrowds are faſtened to the puttock-plates, by dead eyes and laniards, as the others are.

SHRUB, among naturaliſts, denotes a dwarf-tree, or a woody plant leſs than a tree; ſuch are holly, box, privet, *&c.*

SHUTTLE, in the manufactures, an inſtrument much uſed by weavers, in the middle of which is an eye, or cavity, wherein is incloſed the ſpoul with the woof.

SI, in muſick, a ſeventh note or ſound, added by Le Maire to the ſix ancient notes invented by Guido Aretine, *viz. ut, re, mi, fa, ſol, la, ſi.*

SIAM, the capital of a kingdom of the ſame name, in the further peninſula of India: E. long. 101°, N. lat. 14°.

SIC

SIBA, a province of the hither India, ſituated between Tibet on the eaſt, and Lahor on the weſt.

SIBALDIA, in botany, a genus of the pentandria pentagynia claſs. The calix conſiſts of ten ſegments, and the corolla of five petals inſerted into the calix; the ſtyli are placed on the ſide of the germen; and there are five ſeeds. The ſpecies are two, only one of them *viz.* the procumbens, or baſtard cinquefoil, a native of Britain.

SIBERIA, or ASIATIC RUSSIA, the moſt northern country of Aſia, ſituated between 60° and 130° E. long. and between 47° and 72° N. lat. being upwards of two thouſand miles in length from eaſt to weſt, and one thouſand five hundred miles in breadth from north to ſouth. We include the Calmuc Tartars within the limits of Siberia, as they acknowledge themſelves ſubject to the empire of Ruſſia.

SIBTHORPIA, in botany, a genus of the didynamia angioſpermia claſs. The calix conſiſts of five ſegments, and the corolla of five equal ones; the pairs of ſtamina are remote; the capſule is compreſſed, globular, and has two cells, with a tranſverſe diſſepimentum.

SIBYLS, in pagan antiquity, certain women ſaid to have been endowed with a prophetic ſpirit, and to have delivered oracles foreſhewing the fates and revolutions of kingdoms, *&c.*

The moſt eminent of the ten ſibyls mentioned by ancient writers, was ſhe whom the Romans called the Cumæan or Erythræan ſibyl, from her being born at Erythræ in Ionia, and removing from thence to Cumæ in Italy, where ſhe delivered all her oracles from a cave dug out of the main rock, according to Virgil, Æn. III. 441, *&c.*

There is ſtill preſerved, in eight books of Greek verſes, a collection of verſes pretended to have been delivered by the ſibyls; but the generality of critics look upon it as ſpurious: and it is the opinion of Prideaux, that the ſtory of the three books of the ſibyls, ſold to Tarquin, was a ſtate-trick or fetch of politics.

SICILY, the largeſt of all the Italian iſlands, anciently called Trinacria, from its triangular figure: it is ſituated between 12° and 16° E long and between 37° and 39° N. lat. being about one hundred and ſeventy miles long, and one hundred broad.

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It is ſeparated from Calabria, in Italy, by the ſtraights of Meſſina, which, in the narroweſt part, is not ſeven miles over.

SICYOS, in botany, a genus of the monœcia ſyngeneſia claſs. The calix and corolla of the male have each five ſegments; and there are three filaments; the calix and corolla of the female are the ſame with thoſe of the male; the ſtylus is trifid; and the drupa contains one ſeed. There are two ſpecies, none of them natives of Britain.

SIDA, in botany, a genus of the monadelphia polyandria claſs. The calix is ſimple and angular; the ſtylus is divided into many parts; and there are many capſules, each containing one ſeed. There are 23 ſpecies, none of them natives of Britain.

SIDEREAL YEAR. See ASTRONOMY, p. 458.

SIDERIA, in natural hiſtory, the name of a genus of cryſtals, uſed to expreſs thoſe altered in their figure by particles of iron. Theſe are of a rhomboidal form, and compoſed only of ſix planes. Of this genus there are four known ſpecies: 1. A colourleſs, pellucid, and thin one, found in conſiderable quantities among the iron ores of the foreſt of Dean in Glouceſterſhire, and in other the like places. 2. A dull, thick, and brown one, not uncommon in the ſame places with the former. And, 3. A black and very gloſſy kind, a foſſil of very great beauty, found in the ſame place with the others, as alſo in Leiceſterſhire and Suſſex.

SIDERITIS, in botany, a genus of the didynamia gymnoſpermia claſs. The ſtamina are within the tube of the corolla; and there is a ſhort ſtigma over-lopping another one. The ſpecies are eleven, none of them natives of Britain.

SIDEROXYLUM, in botany, a genus of the pentandria monogynia claſs. The corolla conſiſts of ten ſegments alternated crooked inwards; the ſtigma is ſimple; and the berry contains five ſeeds. There are three ſpecies, none of them natives of Britain.

SIDMOUTH, a port-town of Devonſhire, ſituated on a bay of the Engliſh channel, ten miles ſouth-eaſt of Exeter.

SIDON, or SAYD, a port-town of Paleſtine, in Aſiatic Turky, ſeventy miles north of Jeruſalem. It is ſtill a place of ſome conſideration, being the reſidence of a Turkiſh baſhaw.

SIDRA, an iſland of the Archipelago, ſituated at the entrance of the gulph of Napoli.

SIEGE, in the art of war, the encampment of an army before a fortified place, with a deſign to take it.

SIENNA, a city of Italy, in the duchy of Tuſcany, ſituated thirty-ſix miles ſouth of Florence.

SIERRA LEON, a river of Guinea, which falls into the Atlantic ocean, in W. long 14°, and N. lat. 7°.

SIEUR, a title of reſpect among the French, like *maſter* among us: it is much uſed by the lawyers, as alſo by ſuperiors in their letters to inferiors.

SIGAN, a town of China, in the province of Xenſi: E. long. 108°, and N. lat. 34°.

SIGESBECKIA, in botany, a plant of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is paleaceous; it has no pappus; the involucrum has five leaves; and the radius is dimidiated. There are two ſpecies, none of them natives of Britain.

SIGETH, a town of lower Hungary, ſituated ſeventy-three miles ſouth-weſt of Buda, and ſubject to the houſe of Auſtria.

SIGHT, or VISION. See OPTICS.

SIGISTAN, the capital of a province of the ſame name, in Perſia: E. long. 62°, and N. lat. 31°.

SIGN, in general, the mark or character of ſomething abſent or inviſible.

Among phyſicians, the term ſign denotes ſome appearance in the human body, which ſerves to indicate or point out the condition of the patient, with regard to health or diſeaſes.

SIGN, in algebra. See ALGEBRA, p. 80.

SIGN, in aſtronomy. See ASTRONOMY, p. 435.

SIGNATURE, a ſigning of a perſon's name at the bottom of an act or deed, wrote by his own hand.

SIGNATURE, in Scots law. See LAW, Tit. xii. 24.

SIGNATURE, in printing, is a letter put at the bottom of the firſt page at leaſt, in each ſheet, as a direction to the binder in folding, gathering, and collating them. The ſignatures conſiſt of the capital letters of the alphabet, which change in every ſheet: if there be more ſheets than letters in the alphabet, to the capital letter is added a ſmall one of the ſame ſort, as A a, B b; which are repeated as often as neceſſary. In large volumes it is uſual to diſtinguiſh the number of alphabets after the firſt three or four, by placing a figure before the ſignature, as 5 B, 6 B, *&c.*

SIGNET, one of the king's ſeals, made uſe of in ſealing his private letters, and all grants that paſs by bill ſigned under his majeſty's hand: it is always in the cuſtody of the ſecretaries of ſtate.

SIGNET, in Scots law. See LAW, Tit. iii. 16.

SILENE, in botany, a genus of the decandria trigynia claſs. The calix is ventricoſe; the corolla conſiſts of five unguiculated petals; and the capſule has three cells. There are 34 ſpecies, 6 of them natives of Britain.

SILESIA, a duchy belonging to the king of Pruſſia, two hundred miles long, and ſeventy broad: it is bounded by Brandenburgh on the north, by Poland on the eaſt, by Hungary on the ſouth, and by Moravia and Bohemia on the weſt.

SILESIAN EARTH, in the materia medica, a fine aſtringent bole. It is very heavy, of a firm compact texture, and in colour of a browniſh yellow. It breaks eaſily between the fingers, and does not ſtain the hands; is naturally of a ſmooth ſurface, and is readily diffuſible in water, and melts freely into a butter-like ſubſtance in the mouth. It leaves no grittineſs between the teeth, and does not ferment with acid menſtrua. It is found in the perpendicular fiſſures of rocks near the gold-mines at Strigonium in Hungary, and is ſuppoſed to be impregnated with the ſulphur of that metal. It is a good aſtringent, and better than moſt of the boles in uſe.

SILIQUA, a term uſed by botaniſts to denote a pod.

SILIQUA. See BOTANY, p. 637.

SILK, is properly an animal fluid, hardened by the air; being an extremely ſoft and gloſſy thread, ſpun by the ſilk-worm, the body of which conſiſts of eleven rings.

The humours found in the body of this inſect approach to the nature of ſilk; ſince, on being rubbed in the hand, they leave a ſolid cruſt behind. In the ſides of the belly, all about the ventricle, there are depoſited a vaſt number of veſſels, which contain the ſilky juice: theſe run with various windings and meanders to the mouth; and are ſo diſpoſed,

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diſpoſed, that the creatures can diſcharge their contents at pleaſure at the mouth; and, according to the nature of the juices that they are ſupplied with, furniſh different ſorts of ſilk from them, all the fluid contents of theſe veſſels hardening in the air into that ſort of thread that we find the web or balls of this creature conſiſt of.

As ſoon as the ſilk-worm is arrived at the ſize and ſtrength neceſſary for beginning his cod, he makes his web; for it is thus they call that ſlight tiſſue which is the beginning and ground of this admirable work. This is his firſt day's employment. On the ſecond he forms his folliculus or ball, and covers himſelf almoſt over with ſilk. The third day he is quite hid; and the following days employs himſelf in thickening and ſtrengthening his ball; always working from one ſingle end, which he never breaks by his own fault; and which is ſo fine, and ſo long, that thoſe who have examined it attentively think they ſpeak within compaſs, when they affirm, that each ball contains ſilk enough to reach the length of ſix Engliſh miles.

In ten days time the ball is in its perfection, and is now to be taken down from the branches of the mulberry tree, where the worms have hung it. But this point requires a deal of attention: for there are ſome worms more lazy than others; and it is very dangerous waiting till they make themſelves a paſſage, which uſually happens about the fifteenth day of the month.

The firſt, fineſt, and ſtrongeſt balls are kept for the grain, the reſt are carefully wound; or if it is deſired to keep them all, or if there be more than can be well wound at once, they lay them for ſome time in an oven moderately hot, or elſe expoſe them for ſeveral days ſucceſſively to the greateſt heats of the ſun, in order to kill the inſect, which, without this precaution, would not fail to open itſelf a way to go and uſe thoſe new wings abroad it has acquired within.

Ordinarily, they only wind the more perfect balls; thoſe that are double, or too weak, or too coarſe, are laid aſide, not as altogether uſeleſs, but that, being improper for winding, they are reſerved to be drawn out into ſkains. The balls are of different colours; the moſt common are yellow, orange-colour, iſabella, and fleſh colour; there are ſome alſo of a ſea-green, others of a ſulphur colour, and others white; but there is no neceſſity for ſeparating the colours and ſhades to wind them apart, as all the colours are to be loſt in the future ſcouring and preparing of the ſilk

In the philoſophical tranſactions, nº 252, we find the following obſervations concerning the goodneſs of ſilk, which is beſt diſtinguiſhed by its lightneſs. The organcine ſilk is the beſt made in the country of Piedmont of any; and two threads are equal in fineneſs, that is, in ſmoothneſs, thickneſs, and length, for the thread of the firſt twiſt. For the ſecond, it matters not whether the ſingle thread be ſtrong before the two are joined, unleſs to ſee whether the firſt twiſt prove well.

It is neceſſary that the ſilk be clean; and it is to be obſerved, that the ſtraw-coloured is generally the lighteſt, and the white the heavieſt of all. The ſkains ſhould be even, and all of an equality, which ſhews that they were wrought together: otherwiſe we may with juſtice ſuſpect that it is refuſe ſilk, and cannot be equally drawn out and ſpun; for one thread will be ſhorter than the other, which is labour and loſs.

It will alſo be requiſite to ſearch the bale more than once, and take from out of the parcels a ſkain to make an eſſay; for unleſs it be known, by trial, what one buys, there is the greateſt danger of being cheated in this commodity. To make an eſtimate and know the lightneſs, fix the eſſay upon one eighth of a portée or hand of ſilk of a hundred and ten aunes or ells of Lyons in length, and ſee what it makes of aunes by the eighth part. The ſkain, which is of eighty threads, muſt be multiplied by a hundred and ten aunes of Lyon, and from this number muſt be deducted one eighth: as for example, 110 by 80 makes 8800, the eighth part of which is 1100: and this is the eighth part of a portée, or hand of ſilk. Now, to calculate what theſe 1100 aunes weigh, which is the eighth part of a portée, or of 1100 aunes of Lyons, it will be proper to take a ſkain out of the parcels, which you take out from the bale which you judge may contain at leaſt 1100 aunes, to make the one eighth part of a portée; which portée muſt be divided on two bobbins, half on each; then fix the two bobbins on the centre, or beam, and from thence paſs it through the comb hurdiſſoir, *viz.* 550 from the two bobbins, will make 1100, which will be one eighth part of what you deſire to know. This done, you cut off your ſilk, and carry it to put on the hurdiſſoir: then weigh it, and multiply the weight by eight, it will weigh juſt as much as a portée of 110 aunes of Lyons, which is the general rule for calculating. When they draw the ſilk out by this means, one may learn to adjuſt the weight.

There are ſilks of Piedmont, which are very light and clean, and are to be preferred before any on the ſale: the portée of ſilk of the lighteſt weighs near twenty-four penny-weights, and from this it ariſes in gravity to twenty-five and twenty-ſix penny-weights the portée, and ſometimes to twenty-ſeven and twenty eight: but even theſe weights may be diſpenſed with, provided that the other qualities be good, that is, that it be well wrought, even and clean. When the ſilk is more than twenty-eight penny-weights the portée, it muſt always be proportionably cheaper.

Methods of preparing SILKS. The ſeveral preparations which ſilks undergo to fit them to be uſed in the manufacture of ſilken ſtuffs, are reeling, ſpinning, milling, bleaching, and dying. To wind ſilks from off the balls, two machines are neceſſary; the one a furnace, with its copper; the other a reel, or frame, to draw the ſilk. The winder, then, ſeated near the furnace, throws into the copper of water over the furnace (firſt heated and boiled to a certain degree, which cuſtom alone can teach) a handful or two of balls, which have been firſt well purged of all their looſe furry ſubſtance. She then ſtirs the whole very briſkly about with birchen rods, bound and cut like bruſhes; and when the heat and agitation have detached the ends of the ſilks of the pods, which are apt to catch on the rods, ſhe draws them forth; and joining ten or twelve, or even fourteen of them together, ſhe forms them into threads, according to the bigneſs required to the works they are deſtined for: eight ends ſufficing for ribbands; and velvets, *&c.* requiring no leſs than fourteen. The ends, thus joined into two or three threads, are firſt paſſed into the holes of three iron rods, in the fore-part of the reel, then upon the bobbins or pullies, and at laſt are drawn out to the reel itſelf, and there faſtened each to an end of an arm or branch of the reel. Thus diſpoſed, the winder, giving motion to the

reel,,

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reel, by turning the handle, guides the threads; ſubſtitutes new ones, when any of them break, or any of the balls are wound out; ſtrengthens them, where neceſſary, by adding others; and takes away the balls wound out, or that, having been pierced, are full of water.

In this manner, two perſons will ſpin and reel three pounds of ſilk in a day; which is done with greater diſpatch than is made by the ſpinning-wheel or diſtaff. Indeed, all ſilks cannot be ſpun and reeled after this manner; either by reaſon the balls have been perforated by the ſilk worms themſelves; or becauſe they are double, or too weak to bear the water; or becauſe they are coarſe, *&c.* Of all theſe together, they make a particular kind of ſilk, called floretta; which being carded, or even ſpun on the diſtaff, or the wheel, in the condition it comes from the ball, makes a tolerable ſilk.

As to the balls, after opening them with ſciſſars, and taking out the inſects (which are of ſome uſe for the feeding of poultry,) they are ſteeped three or four days in troughs, the water whereof is changed every day to prevent their ſtinking. When they are well ſoftened by this ſcouring, and cleared of that gummy matter the worm had lined the inſide withal, and which renders it impenetrable to the water, and even to air itſelf, they boil them half an hour in a lye of aſhes, very clear and well ſtrained; and after waſhing them out in the river, and drying them in the ſun, they card and ſpin them on the wheel, *&c.* and thus make another kind of floretta, ſomewhat inferior to the former.

As to the ſpinning and reeling of raw ſilks off the balls, ſuch as they are brought from Italy and the Levant, the firſt is chiefly performed on the ſpinning-wheel; and the latter, either on hand-reels, or on reels mounted on machines, which ſerve to reel ſeveral ſkains at the ſame time. See REEL.

As to the milling, they uſe a mill compoſed of ſeveral pieces, which may mill two or three hundred bobbins at once, and make them into as many ſkains.

For the dying of ſilk, ſee DYING.

SILPHIUM, in botany, a genus of the ſyngeneſia polygamia neceſſaria claſs. The receptacle is paleaceous; it has no pappus; the calix conſiſts of three valves; and the radius of the corolla is dimidiated. There are ſix ſpecies, none of them natives of Britain.

SILVER. See CHEMISTRY, p. 79, 130.

SILVERING, the covering of any thing with ſilver. It is uſual to ſilver metals, wood, paper, *&c.* which is performed either with fire, oil, or ſize. Metal-gilders ſilver by the fire; painter-gilders all the other ways.

To ſilver copper or braſs: 1. Cleanſe the metal with aquafortis, by waſhing it lightly, and immediately throwing it into fair water; or by heating it red hot, and ſcouring it with ſalt and tartar, and fair water, with a ſmall wire-bruſh. 2. Diſſolve ſome ſilver in aquafortis, in a broad-bottomed glaſs veſſel, or of glazed earth, then evaporate away the aquafortis over a chaffing-diſh of coals. 3. Put five or ſix times its quantity of water, or as much as will be neceſſary to diſſolve it perfectly, on the remaining dry calx: evaporate this water with the like heat: then put more freſh water, and evaporate again, and, if need be, the third time, making the fire towards the latter end ſo ſtrong, as to leave the calx perfectly dry, which, if your ſilver is good, will be of a pure white. 4. Take of this calx, common-ſalt, cryſtal of tartar, of each a like quantity or bulk; and mixing well the whole compoſition, put the metal into fair water, and take of the ſaid powder with your wet fingers, and rub well on, till you find every little cavity of the metal ſufficiently ſilvered over. 5. If you would have it richly done, you muſt rub on more of the powder; and in the laſt place waſh the ſilvered metal in fair water, and rub it hard with a dry cloth.

SILVERING *of Glaſſes*. See FOLIATING *of Looking-glaſſes*.

SIMIA, the MONKEY, in zoology, a genus of quadrupeds belonging to the order of primates. They have four fore-teeth in each jaw, placed near each other; the dog-teeth are ſolitary, and remote; and the grinders are obtuſe. There are 33 ſpecies: Of theſe, three, *viz.* the ſatyrus, ſylvanus, and inuus, have no tail. Other three of them, *viz.* the nemeſtrina, apedia, and ſphinx, have ſhort tails. The other 27 have long tails. The ſpecific diſtinctions are taken from the colour, and other circumſtances.—The monkey-kind are remarkable for activity, a low ſpecies of cunning, and a facility of imitating the actions of men and other animals. The ſagacity and docility of the ſimia are ſo well known that it is needleſs to ſpend time in giving inſtances of either.

SIMILE, or SIMILITUDE, in rhetoric, a compariſon of two things, which though different in other reſpects, yet agree in ſome one. The difference between a ſimile and compariſon, is ſaid to conſiſt in this, that the ſimile properly belongs to whatever we call the quality of the thing, and the compariſon to the quantity.

SIMONICAL, is applied to any perſon guilty of ſimony. See SIMONY.

SIMONIANS, in church-hiſtory, a ſect of ancient heretics, ſo called from their founder Simon Magus or the magician. The hereſies of Simon Magus were principally his pretending to be the great power of God, and thinking that the gifts of the Holy Ghoſt were venal, and to be purchaſed with money. He is ſaid to have invented the Æons, which were ſo many perſons of whom the Godhead was compoſed. His concubine Helen, he called the firſt intelligence, and mother of all things; and ſometimes he called her Minerva, and himſelf Jupiter. Simon Magus gained a great many proſelytes, who paid himſelf and his concubine divine worſhip; theſe were the earlieſt heretics, and thoſe that S. John, St Peter, and St Paul, in their epiſtles, ſo often warn the Chriſtians againſt.

SIMONY, in eccleſiaſtical law, the crime of buying or ſelling ſpiritual gifs or preferments. In the ancient Chriſtian church, this crime was always thought to be committed when men either offered or received money for ordinations. The apoſtolical canons lay a double puniſhment both of depoſition and excommunication on ſuch of the clergy as were found guilty of it. This was the firſt ſort of ſimony, and that which was moſt properly ſo called; and to this the ancients reduced the exacting of any reward for adminiſtering the euchariſt or baptiſm, or for any ſpiritual offices. A ſecond ſort of ſimony conſiſted in buying the ſpiritual preferments of the church: this was puniſhed with depoſition in any biſhop, who promoted any church-officer for the ſake of lucre; and the perſons ſo promoted were to be degraded from their office. By the laws of Juſtinian, every elector was to depoſe

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poſe upon oath, that he did not chuſe the perſon elected for any gift or promiſe, or friendſhip, or any other cauſe, but only becauſe he knew him to be a man of the true catholic faith, of unblameable life, and good learning. This laſt ſort of ſimony was, when men, by ambitious arts and undue practices, got themſelves inveſted in an office or preferment to which they had no regular call, or when they intruded themſelves into other mens places which were legally filled before. The caſuiſts for the church of Rome maintain, that all compacts or bargains in which benefices are concerned, are ſimonical, when it is done without the pope's concurrence; but that, once obtained, gives a ſanction to the thing; which they found upon this univerſal propoſition, that the pope cannot commit ſimony in beneficiary matters, ſince he hath a power ſo abſolute over all the eccleſiaſtical goods and benefices, that he can unite, divide, and beſtow them in whatever manner he pleaſes.

Againſt the corruption of ſimony, there have been many canons made in our own church, which puniſhes the offender with deprivation, diſability, *&c.* and by a ſtatute of the 31 Eliz. it is enacted, that if any perſon, for any ſum of money, reward, gift, profit, or benefit, or by reaſon of any promiſe, agreement, grant, bond, covenant, or other aſſurance, ſhall preſent, or collate any perſon to any benefice with cure, dignity, or living eccleſiaſtical, every ſuch preſentation, or collation, and every admiſſion or induction thereupon, ſhall be utterly void, and the crown ſhall preſent for that turn; and the perſon that ſhall give or take any ſum of money, *&c.* ſhall forfeit double the value of one year's profit of any ſuch benefice; and the perſon ſo corruptly taking any ſuch benefice, ſhall from thenceforth be diſabled to have and enjoy the ſame.

SIMPLE, ſomething not mixed or compounded; in which ſenſe, it ſtands oppoſed to compound.

SIMPLE, in pharmacy, a general name given to all herbs or plants, as having each its particular virtue, whereby it becomes a ſimple remedy.

SIN, a breach or tranſgreſſion of ſome divine law, or command.

SINAI, a mountain of Arabia Petrea, ſituated eaſt long. 35°, north lat. 29°, and memorable on account of the law's being given to the Jews on this mount.

SINAPI, in botany, a genus of the tetradynamia ſiliquoſa claſs. The calix is open; the petals have ſtraight ungues; and there is a nectarious gland between the ſhort ſtamina and the piſtillum, and between the long ſtamina and the calix. There are ten ſpecies, three of them natives of Britain, *viz.* the nigra, or common muſtard; the alba, or white muſtard; and the arvenſis, or wild muſtard.

Muſtard-ſeed is an attenuant and reſolvent in a very high degree; it warms the ſtomach, and excites an appetite; but its principal medicinal uſe is external in ſinapiſms, applications made to certain parts when irritation is intended, but not bliſtering. It is uſually mixed with horſe-radiſh root, and other ingredients of the ſame kind, for this purpoſe.

SINAPISM, in pharmacy, an external medicine, in form of a cataplaſm, compoſed chiefly of muſtard-ſeed pulverized, and mixed with the pulp of figs, or with briony, garlic, onion, or the like.

SINCIPUT, in anatomy. See ANATOMY, p. 156.

SINCOPORA, a promontory of Malacca in the Eaſt Indies, ſituated in 2° N. lat. oppoſite to the iſland of Sumatra, with which this cape forms the ſtraits called the Straits of Sincopora.

SINDON, in ſurgery, a little round piece of linen, ſilk, or lint, uſed in dreſſing a wound after trepanning.

SINE, or *right* SINE *of an arch*, is a right line drawn from one end of that arch, perpendicular to the radius drawn to the other end of the arch; being always equal to half the chord of twice the arch. See TRIGONOMETRY, and GEOMETRY.

SINE-CURES, eccleſiaſtical benefices without cure of ſouls.

SINEW, denotes what we properly call a nerve; though, in common ſpeech, it is rather uſed for a tendon.

SINGING, the action of making divers inflections of the voice, agreeable to the ear, and correſpondent to the notes of a ſong, or piece of melody.

SINGULAR NUMBER, in grammar. See GRAMMAR.

SINISTER, ſomething on, or towards the left-hand; ſiniſter is alſo uſed among us for unlucky, though in the ſacred rites of divination the Romans frequently uſed it in an oppoſite ſenſe.

SINISTER, in heraldry. The ſiniſter ſide of an eſcutcheon is the left-hand ſide; the ſiniſter chief, the left angle of the chief; the ſiniſter baſe, the left-hand part of the baſe.

SINISTRI, a ſect of ancient heretics, thus called, becauſe they held the left hand in abhorrence, and made it a point of religion not to receive any thing therewith.

SINKING FUND, a proviſion made by parliament, conſiſting of the ſurpluſage of other funds, intended to be appropriated to the payment of the national debts; on the credit of which very large ſums have been borrowed for public uſes.

SINOPICA TERRA, in natural hiſtory, the name of a red earth of the ochre-kind, called alſo rubrica ſinopica, and by ſome authors ſinopis. It is a very cloſe, compact, and weighty earth, of a fine glowing purple colour. It is of a pure texture, but not very hard, and of an even, but duſty ſurface. It adheres firmly to the tongue, is perfectly fine and ſmooth to the touch, does not crumble eaſily between the fingers, and ſtains the hands. It melts very ſlowly in the mouth, and is perfectly pure and fine, and of a very auſtere aſtringent taſte, and ferments very violently with aqua-fortis. It was dug in Cappadocia, and carried for ſale to the city Sinope, whence it had its name. It is now found in plenty in the New-Jerſeys in America, and is called by the people there blood-ſtone. Its fine texture and body, with its high florid colour, muſt make it very valuable to painters, and its powerful aſtringency equally ſo in medicine.

SINOPLE, in heraldry, denotes vert, or the green colour in armories.

Sinople is uſed to ſignify love, youth, beauty, rejoicing, and liberty; whence it is, that letters of grace, abolition, legitimation, *&c.* are always uſed to be ſealed with green wax.

SINUATED LEAF, in botany. See BOTANY, p. 640.

SINUOSITY, a ſeries of bends and turns in arches, or other irregular figures, ſometimes jutting out, and ſometimes falling in.

SINUS, in anatomy, denotes a cavity of certain bones, and other parts, the entrance whereof is narrow, and the bottom wider and more ſpacious.

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SINUS, in ſurgery, a little cavity, or ſacculus, frequently formed by a wound or ulcer, wherein pus is collected.

SION, a town of Switzerland, in the county of Valais, ſituated on the river Rhone, twenty-three miles ſouth-eaſt of the lake of Geneva, being a ſovereign ſtate.

SIPHON, a bended pipe, one end of which being put into a veſſel of liquor, and the other hanging out of the ſaid veſſel over another, the liquor will run out from the firſt into the laſt, after the air has been ſucked out of the external or lower end of the ſiphon, and that as long as the liquor in the upper veſſel is above the upper orifice of the ſiphon.

SIPHONANTHUS, a genus of the tetrandria monogynia claſs. The corolla conſiſts of one funnel-ſhaped petal, with eight ſegments; and there are two berries containing many ſeeds. There is but one ſpecies, a native of India.

SIRANAGER, a city of hither India, capital of the province of Siba, ſituated on the river Ganges: E. long. 80°, N. lat. 31° 30′.

SIRE, a title of honour in France, now given to the king only, as a mark of ſovereignty.

SIREN, in antiquity, a kind of fabulous animal, otherwiſe called a mermaid.

The ſirens are repreſented by Ovid, &c. as ſea-monſters, with womens faces and fiſhes tail; and by others decked with plumage of various colours. The three ſirens are ſuppoſed to be the three daughters of the river Achelous; and are called Parthenope, Ligea, and Leucoſia. Homer makes mention of only two ſirens, and ſome others reckon five. Virgil places them on rocks where veſſels are in danger of ſplitting. Some repreſent them as ſuch charming monſters, who ſung ſo harmoniouſly, that ſailors were wrecked on their rocks without regret, and even expired in raptures.

SIREN, in zoology, a genus belonging to the order of amphibia meantes. The body is naked, and furniſhed with two unguiculated feet, and a tail. It has a great reſemblance to a lizard, only it is larger. It is found in marſhy grounds in Carolina.

SIRIUS, in aſtronomy, a bright ſtar in the conſtellation canis. See ASTRONOMY, p. 487.

SISON, in botany, a genus of the pentandria digynia claſs. The fruit is oval and ſtriated; and the involucrum conſiſts of four leaves. There are ſix ſpecies, three of them natives of Britain, *viz.* the amomum, or baſtard ſtone-parſley; the ſegetum, or corn-parſley; and the inundatum, or leaſt water-parſnep. The ſeed of the amomum is one of the four leſſer hot ſeeds of the ſhops; and is an attenuant, aperient, and carminative.

SISYMBRIUM, in botany, a genus of the tetradynamia ſiliquoſa claſs. The pod opens with ſtraight valves; and the calix and corolla are open. The ſpecies are 25, ſeven of them natives of Britain. The young leaves of the cordamine, or ladies-ſmoke, and of the noſturtium, or water-creſſes, are recommended in the ſcurvy, and eaten in large quantities for that intention with great ſucceſs.

SISYRINCHIUM, in botany, a genus of the gynandria triandria claſs. The ſpatha conſiſts of two leaves, and the corolla of ſix petals; and the capſule has three cells. There is but one ſpecies, a native of Virginia.

SITE, denotes the ſituation of an houſe, &c. and ſometimes the ground-plot, or ſpot of earth it ſtands on.

SITOPHYLAX, in Grecian antiquity, an Athenian magiſtrate, who had the ſuperintendance of the corn, and was to take care that nobody bought more than was neceſſary for the proviſion of his family.

SITTA, in ornithology, a genus belonging to the order of picæ. The bill is ſubulated, cylindrical, ſtrait, and entire; the ſuperior mandible being longer than the inferior, and compreſſed at the point; the tongue is lacerated; and the noſtrils are covered with hairs. There are three ſpecies, diſtinguiſhed by their colour.

SIUM, in botany, a genus of the pentandria digynia claſs. The fruit is ſomewhat oval, and ſtriated; the involucrum conſiſts of many leaves; and the petals are heart-ſhaped. There are 8 ſpecies, three of them natives of Britain, *viz.* the latifolium, or great water-parſnep; the nodiflorum, or creeping water-parſnep; and the erectum, or upright water-parſnep.

SIXTH, in muſick, one of the ſimple original concords, or harmonical intervals. See MUSICK.

SIZE, the name of an inſtrument uſed for finding the bigneſs of fine round pearls. It conſiſts of thin pieces or leaves, about two inches long and half an inch broad, faſtened together at one end by a rivet. In each of theſe are round holes drilled of different diameters. Thoſe in the firſt leaf ſerve for meaſuring pearls from half a grain to ſeven grains; thoſe of the ſecond, for pearls from eight grains, or two carats, to five carats, &c. and thoſe of the third, for pearls from ſix carats and a half to eight carats and a half.

SIZE is alſo a ſort of paint, varniſh, or glue, uſed by painters, &c.

The ſhreds and parings of leather, parchment, or vellum, being boiled in water and ſtrained, make ſize. This ſubſtance is uſed in many trades.

The manner of uſing ſize is to melt ſome of it over a gentle fire; and ſcraping as much whiting into it as may only colour it, let them be well incorporated together; after which you may whiten frames, &c. with it. After it dries, melt the ſize again, and put more whiting, and whiten the frames, &c. ſeven or eight times, letting it dry between each time: but before it is quite dry, between each waſhing, you muſt ſmooth and wet it over with a clean bruſh-pencil in fair water.

To make gold-ſize, take gum animi and aſphaltum, of each one ounce; minium, litharge of gold, and umber, of each half an ounce; reduce all into a very fine powder, and add to them four ounces of linſeed-oil, and eight ounces of drying-oil; digeſt them over a gentle fire that does not flame, ſo that the mixture may only ſimmer, but not boil; for fear it ſhould run over and ſet the houſe a-fire, keep it conſtantly ſtirring with a ſtick till all the ingredients are diſſolved and incorporated, and do not leave off ſtirring it till it becomes thick and ropy; and being boiled enough, let it ſtand till it is almoſt cold, and then ſtrain it through a coarſe linen-cloth and keep it for uſe.

To prepare it for working, put what quantity you may have occaſion to uſe in a horſe-muſcle ſhell, adding ſo much oil of turpentine as will diſſolve it; and making it as thin as the bottom of your ſeed-lac varniſh, hold it over a candle, and then ſtrain it through a linen-rag into another ſhell; add to theſe ſo much vermilion as will

make

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make it of a darkiſh-red: if it is too thick for drawing, you may thin it with ſome oil of turpentine. The chief uſe of this ſize is for laying on metals.

The beſt gold-ſize for burniſhing is made as follows: take fine bole, what quantity you pleaſe, grind it finely on a marble; then ſcrape into it a little beef ſuet; grind all well together; after which mix a ſmall proportion of parchment ſize with a double proportion of water, and it is done.

To make ſilver-ſize: take tobacco-pipe clay, in fine powder; into which ſcrape ſome black-lead and a little Genoa-ſoap; and grind them all together with parchment-ſize, as already directed.

SKAITE, in ichthyology. See RAIA.

SKELETON, in anatomy. See ANATOMY, p. 151.

SKIE, one of the greateſt weſtern iſlands of Scotland, divided from the counties of Roſs and Inverneſs by a narrow channel; being upwards of ſixty miles in length and twenty in breadth.

SKIFF, the leaſt of two ſhip-boats, ſerving chiefly to go aſhore in, when the ſhip is in harbour.

SKIN, in anatomy. See ANATOMY, p. 254.

SKIN, in commerce, is particularly uſed for the membrane ſtripped off the animal to be prepared by the tanner, ſkinner, currier, parchment-maker, *&c.* and converted into leather, *&c.* See TANNING, *&c.*

Skins and the hair of beaſts manufactured become parchment and vellum; leather, of which are made ſhoes and boots, ſaddles, harneſſes, and furniture for horſes, gloves and garments, coaches and chairs, houſehold ſtuff, covers of books, drinking veſſels, *&c.* and furrs for cloathing, hats, caps, *&c.*

SKINNER, one who works in ſkins. See SKIN.

SKIPTON, a town in the weſt riding of Yorkſhire, ſituated thirty five miles weſt of York.

SKIRMISH, in war, a diſorderly kind of combat, or encounter, in preſence of two armies, between ſmall parties, or perſons, who advance from the body for that purpoſe, and introduce to a general and regular fight.

SKULL, in anatomy. See ANATOMY, p. 151.

SKY, the blue expanſe of air and atmoſphere.

The azure colour of the ſky Sir Iſaac Newton attributes to vapours beginning to condenſe there, and which have got conſiſtence enough to reflect the moſt reflexible rays.

SLAB, an outſide ſappy plank or board ſawed off from the ſides of a timber-tree: the word is alſo uſed for a flat piece of marble.

SLATE, a ſtone of a compact texture and laminated ſtructure, ſplitting into fine plates

Dr Hill diſtinguiſhes four ſpecies of ſlate ſtegania: 1. The whitiſh ſteganium, being a ſoft, friable, flaty ſtone, of a tolerably fine and cloſe texture, conſiderably heavy, perfectly dull and deſtitute of brightneſs, variegated with a pale brown, or browniſh yellow: this ſpecies is very common in many counties in England, lying near the ſurface of the ground; it is generally very full of perpendicular as well as horizontal cavities, many of which are filled up with a ſpar a little purer and more cryſtalline than the reſt, and is commonly uſed for covering houſes. 2. The red ſteganium is a very fine and elegant ſlate, of a ſmooth ſurface, firm and compact texture, conſiderably heavy, and of a very beautiful pale purple, glittering all over with ſmall gloſſy ſpangles: it is compoſed of a multitude of very thin plates or flakes, laid cloſely and evenly over one another, and cohering pretty firmly: this is very common in the northern parts of England, and is much valued as a ſtrong and beautiful covering for houſes. 3. The common blue ſteganium is very well known, as an uſeful and valuable ſtone, of a fine ſmooth texture and gloſſy ſurface, moderately heavy, and of a pale greyiſh blue; compoſed of a multitude of even plates, laid cloſe upon one another, and eaſily ſplitting at the commiſſures of them: this is alſo very common in the north parts of England, and is uſed in moſt places for the covering of houſes. There are other ſpecies of this ſlate, *viz.* The browniſh blue friable ſteganium, uſually called coal ſlate; the greyiſh black friable ſteganium, commonly called ſhiver, and the greyiſh blue ſparkling ſteganium. 4. The friable, aluminous, black ſteganium, being the Iriſh ſlate of the ſhops: this is compoſed of a multitude of thin flakes laid very evenly and regularly over one another, and ſplits very readily at the commiſſures of them. It is common in many parts of Ireland, and is found in ſome places in England, always lying near the ſurface in very thick ſtrata. In medicine, it is uſed in hæmorrhages of all kinds with ſucceſs, and is taken often as a good medicine in fevers.

There is a ſort of ſlate-ſtones called, by Dr Hill, ammoſchiſta. Of this kind there are only two ſpecies: 1. That compoſed only of ſparry and cryſtalline particles; or the grey, friable, dull ammoſchiſtum; being a coarſe, harſh, and rough ſtone, of a very looſe texture, conſiderably heavy; and compoſed of a large, coarſe, obtuſely angular gritt, ſurrounded, and in part held together, by a looſe earthy ſpar. This ſtone is very common in moſt countries, and is frequently uſed to cover houſes, inſtead of tiles: it bears the weather but badly, and is apt to crumble after froſts. 2. That compoſed of talcy, ſparry, and cryſtalline particles. This comprehends five ſpecies, *viz.* the browniſh white glittering ammoſchiſtum; the greeniſh grey ſhining ammoſchiſtum; the yellowiſh grey glittering ammoſchiſtum; the hard purple and white laminated ammoſchiſtum; and the bluiſh glittering ſlate ſtone. Theſe ſorts of ſlate-ſtone are very common in the northern countries, and are uſed in covering houſes, paving, building, *&c.*

SLAVE, a perſon in the abſolute power of a maſter, either by war or conqueſt. We find no mention of ſlaves before the deluge; but immediately after, *viz.* in the curſe of Canaan: whence it is eaſily inferred, that ſervitude increaſed ſoon after that time; for in Abraham's time we find it generally eſtabliſhed.

Among the Romans, when a ſlave was ſet at liberty, he changed his name into a ſurname, and took the nomen or prenomen of his maſter; to which he added the cognomen he had been called by when a ſlave. Great part of the Roman wealth conſiſted in ſlaves: they had the power of life and death over them, which no other nation had; but this ſeverity was afterwards moderated by the laws of the emperors. The ſlaves were eſteemed the proper goods of their maſters, and all they got belonged to them; but if the maſter was too cruel in his correction, he was obliged to ſell his ſlave at a moderate price.

Slavery is abſolutely aboliſhed in Britain and France, as to perſonal ſervitude. Slaves make a conſiderable article

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ticle of the traffick in America. The Britiſh ſouth-ſea company have, by treaty, the ſole privilege of furniſhing the Spaniſh Weſt Indies with ſlaves.

SLAUGHTER. See MANSLAUGHTER, HOMICIDE, MURDER, &c.

SLEDGE, a kind of carriage without wheels, for the conveyance of very weighty things, as huge ſtones, &c.

SLEEP, is defined to be that ſtate wherein the body appearing perfectly at reſt, external objects move the organs of ſenſe as uſual, without exciting the uſual ſenſations.

Sleep is broken off unnaturally, when any of the organs of ſenſation is ſo briſkly acted on, that the action is propagated to the brain.

Sleep being one of the non-naturals, it is not poſſible for thoſe to preſerve their health, who do not go to ſleep in a regular manner: for ſleep repairs the ſpirits, which are diſſipated by watching; and conſequently it reſtores the ſtrength of thoſe who are weak, indiſpoſed, or labour much. It likewiſe promotes perſpiration, contributes greatly to digeſtion, and more to nutrition. The night is the moſt proper for ſleep; for the vigour of the mind and body are better reſtored in the night than in the day; thus nocturnal labour and lucubrations impair the health.

SLEEPER, or the GREAT SLEEPER, in zoology. See MUS.

SLEEPERS, in natural hiſtory, a name given to ſome animals which are ſaid to ſleep all the winter; ſuch as bears, marmotes, dormice, bats, hedge hogs, ſwallows, &c. Theſe do not feed in winter, have no ſenſible evacuations, breathe little or not at all, and moſt of the viſcera ceaſe from their functions. Some of theſe creatures ſeem to be dead, and others to return to a ſtate like that of the fœtus before the birth: in this condition they continue, till by length of time maturating the proceſs, or by new heat, the fluids are attenuated, the ſolids ſtimulated, and the functions begin where they left off.

SLEEPERS, in the glaſs-trade, are the large iron-bars croſſing the ſmaller ones, and hindering the paſſage of the coals, but leaving room for the aſhes.

SLEEPERS, in a ſhip, timbers lying before and aft, in the bottom of the ſhip, as the rung-heads do: the lowermoſt of them is bolted to the rung-heads, and the uppermoſt to the futtocks and rungs.

SLESWICK, the capital of the duchy of Sleſwick, otherwiſe called South Jutland, ſituated on the river Sley: E. long. 9° 45′, and N. lat. 54° 45′. See JUTLAND.

SLIDING, in mechanics, is when the ſame point of a body, moving along a ſurface, deſcribes a line on that ſurface.

SLIGO, a county of Ireland, in the province of Connaught, bounded by the ocean on the north, by Letrim on the eaſt, by Roſcommon on the ſouth, and by Mayo on the weſt.

SLING, an inſtrument ſerving for caſting ſtones with great violence. The inhabitants of the Balearic iſlands were famous in antiquity for the dexterous management of the ſling: it is ſaid they bore three kinds of ſlings, ſome longer, others ſhorter, which they uſed according as their enemies were either nearer or more remote. It is added, that the firſt ſerved them for a head-band, the ſecond for a girdle, and that a third they conſtantly carried with them in the hand.

SLIPPING, among gardeners, the tearing off a ſprig from a branch, or a branch from an arm of the tree. Theſe ſort of ſlips take root more readily than cuttings.

SLOANEA, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of five petals, and the calix of five deciduous leaves; the ſtigma is perforated; and the berry contains many ſeeds.

SLOATH, in zoology. See BRADYPUS.

SLOE. See PRUNUS.

SLOOP, a ſort of floating veſſel, otherwiſe called ſhallop. In our navy, ſloops are tenders on the men of war, and are uſually of about ſixty tons, and carry about thirty men.

SLOUGH, a deep muddy place. The caſt ſkin of a ſnake, the damp of a coal-pit, and the ſcar of a wound, are alſo called by the ſame appellation. The ſlough of a wild boar, is the bed, ſoil, or mire, wherein he wallows, or in which he lies in the day-time.

SLUCZK, the capital of the palatinate of the ſame name, in the duchy of Lithuania and kingdom of Poland: ſituated in E. long. 27°, and N lat. 53°.

SLUICE, in hydraulics, a frame of timber, ſtone, earth, &c. ſerving to retain and raiſe the water of the ſea, a river, &c. and on occaſion to let it paſs: ſuch is the ſluice of a mill, which ſtops and collects the water of a rivulet, &c. in order to diſcharge it at length in greater plenty upon the mill-wheel; ſuch alſo are thoſe uſed in drains, to diſcharge water off lands; and ſuch are the ſluices of Flanders, &c. which ſerve to prevent the waters of the ſea overflowing the lower lands, except when there is occaſion to drown them. See CANAL.

SLUTTELBURG, a town of Ruſſia, in the province of Ingria, ſituated on the ſouth-ſide of the lake Ladogo, in E. long. 31° 20′, N lat. 60°.

SLUYS, a port-town of Dutch Flanders, ſituate oppoſite to the iſland of Cadſant: E. long. 3° 15′, N. lat. 51° 18′.

SMACK, a ſmall veſſel with but one maſt.

SMALAND, a province in Sweden, in the territory of Gothland, bounded by Eaſt Gothland, on the north; by the Baltic ſea, on the eaſt; by Blecking, on the ſouth; and by Halland, on the weſt.

SMALLAGE, in botany. See APIUM.

SMALT, a preparation of arſenic. See CHEMISTRY, p. 145.

SMARAGDUS, in natural hiſtory. See EMERALD.

SMARIS, in ichthyology. See SPARUS.

SMELL, with regard to the organ, is an impreſſion made on the noſe, by little particles continually exhaling from odorous bodies: with regard to the object, it is the figure and diſpoſition of odorous effluvia, which ſtriking on the organ, excite the ſenſe of ſmelling: and with regard to the ſoul, it is the perception of the impreſſion of the object on the organ, or the affection in the ſoul reſulting therefrom.

The principal organs of ſmelling are the noſtrils, and the olfactory nerves; the minute ramifications of which latter are deſcribed throughout the whole concave of the former. See ANATOMY, p. 293.

SMELT, in ichthyology, a ſpecies of ſalmo. See SALMO.

SMELTING, in metallurgy, the fuſion or melting of the ores of metals, in order to ſeparate the metalline part from

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from the earthy, ſtony, and other parts. See CHEMISTRY, *paſſim*.

SMILAX, in botany, a genus of the dioecia hexandria claſs. The calix both of male and female conſiſts of ſix leaves; none of them have any corolla; the ſtylus of the female is triſid; and the berry has three cells, containing two ſeeds. There are 13 ſpecies, none of them natives of Britain.

SMITHERY, a manual art, by which an irregular lump of iron is wrought into any intended ſhape, by means of fire, hammering, filing, *&c.*

SMOKE, a denſe elaſtic vapour, ariſing from burning bodies. As this vapour is extremely diſagreeable to the ſenſes, and often prejudicial to the health, mankind have fallen upon ſeveral contrivances to enjoy the benefit of fire, without being annoyed by ſmoke. The moſt univerſal of theſe contrivances is a tube leading from the chamber in which the fire is kindled, to the top of the building, through which the ſmoke aſcends, and is diſperſed into the atmoſphere. Theſe tubes are called chimneys; which, when conſtructed in a proper manner, carry off the ſmoke entirely; but, when improperly conſtructed, they carry off the ſmoke imperfectly, to the great annoyance of the inhabitants. As our maſons at preſent ſeem to have a very imperfect knowledge of the manner in which chimneys ought to be built, we can hardly perform a more acceptable ſervice to the public than to point out the manner in which they ought to be conſtructed ſo as to carry off the ſmoke entirely; as well as to explain the cauſes from which the defects ſo often complained of generally proceed, and the method of removing them.

Although we would naturally imagine, that the cauſes which occaſion ſmoke in rooms are exceedingly various; yet, upon examination, it will be found that they may all be reduced to one of theſe three general heads, each of which will admit of ſeveral varieties.

I. To a fault in the form of the tube, or chimney itſelf.

II. To ſome fault in the other parts of the building, and a wrong poſition of the chimney with reſpect to theſe. Or,

III. To an improper ſituation of the houſe with reſpect to external objects. And it is of the utmoſt conſequence, in attempting a cure accurately to diſtinguiſh from which of theſe defects the ſmoke proceeds, it will be neceſſary to point out with care the ſeveral phenomena which are peculiar to each.

I. Of ſmoke occaſioned by a fault in the form of the chimney itſelf. But, before we proceed, it will be neceſſary to premiſe ſomething with regard to the general cauſe of the aſcent of ſmoke in chimneys.

The earth is every where ſurrounded with a great body of air, called the atmoſphere. This air is an elaſtic fluid ſubjected to many particular laws, as hath been fully explained under the particle PNEUMATICS; where it hath been ſufficiently demonſtrated, that, like other fluids, it hath a conſtant tendency to preſerve an equilibrium in all its parts; ſo that, if at any time the weight of it at one place is diminiſhed, the heavier air ruſhes from all ſides towards that point, till the equilibrium be again reſtored. We there likewiſe ſaw, that heat was one of the moſt powerful means of diſturbing this general equilibrium of the air, by expanding it to a great degree, and making the ſame quantity occupy a much greater ſpace than before, and conſequently become lighter. Hence it neceſſarily follows, that where-ever a fire is kindled, the air immediately contiguous to it will be heated, and of conſequence rarified and made light; which muſt aſcend into the higher regions of the atmoſphere, till it becomes of the ſame gravity with the air contiguous to it; while the denſer cold air below ruſhes toward the point from which it departed, is there heated and rarefied in its turn, and aſcends in the ſame manner, carrying the ſmoke or vapour ariſing from the burning body along with it. In this manner that conſtant ſuction of air towards every fire is produced, and from this cauſe proceeds the conſtant tendency of ſmoke to aſcend upwards from the ſurface of the earth. But as the body of our atmoſphere is often agitated with wind, *&c.* and as it is an elaſtic fluid, it endeavours to ſpread itſelf every way; from which cauſes the warm air would quickly be diffuſed among the cold air before it could ariſe to any conſiderable height; ſo that the ſmoke would always remain low, and be toſſed about near the ſurface of the earth: all of which inconveniencies are avoided by confining this heated air in a tube, which prevents it from mixing with the external air, till it arrive at the height to which we deſire it ſhould aſcend.

To render this ſtill more clear, ſee Plate CLVI. where AB (fig. 1.) repreſents the tube of a chimney, having a fire at the bottom at A. It is obvious, that, in this ſituation, the air which was heated by the fire at A, will aſcend directly upwards, without mixing with the external air, till it arrives at B, beyond which it will be at liberty to diſperſe in the atmoſphere; and the more weighty air which preſſes in to ſupply its place can have no acceſs to it but at the opening between A and E, where it alſo is heated by the fire, and in its turn aſcends to the top of the chimney, thereby occaſioning a conſtant ſtream of air to aſcend up the chimney, which carries the ſmoke along with it. This is the manner in which fuliginous vapours are made to aſcend in chimneys; and by attending to it, we may draw the following corollaries with regard to the conſtruction of this uſeful part of our habitations.

Iſt, The higher the chimney, that is, the greater the diſtance between the fire-place and the top of the chimney, the greater will be the difference between the weight of the column of heated air in the tube, and another column of the atmoſphere of the ſame diameter without the chimney, and conſequently the air will enter with the greater force at the opening AE, and carry up the ſmoke more readily along with it: for as the warm air within the tube continues rarefied to a high degree till it iſſues from the top of the chimney, and is, in every part of its length, lighter than the ſame bulk of external air marked by the dotted line CD, it follows, that the longer theſe two columns of unequal gravity are, the greater muſt be the difference of their weight. Hence it is, that high chimneys (*cæteris paribus*) have a greater ſuction of air, and are leſs liable to vent ill, than low ones. A ſmoky chimney may therefore ſometimes be cured by raiſing it higher. It is likewiſe obvious, that if any opening is made into the chimney, as at F, the air will enter with leſs force at E, and carry up the ſmoke with leſs velocity, and by that means be in danger of producing ſmoke in the room; for this opening, as it admits the freſh air into the tube, has nearly the ſame effect as ſhortening the tube ſo much would have.

2d, As the ſmoke is forced up the chimney merely by the rarefaction

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rarefaction of the air in conſequence of heat, it is evident, that the more the air is heated, with the greater force (*ceteris paribus*) will it aſcend, becauſe the difference between the weight of the external and internal air will be greater; and as the air will be the more heated the nearer it is made to paſs by the fire in its entry into the chimney, it is evident, that the ſmaller the opening at AE is, or, in other words, the lower the mantle of the chimney is, the air will be forced to paſs the nearer the fire, and therefore be more rarefied, and aſcend with the greater velocity; ſo that lowering the mantle of the chimney will often cure ſmoke.

But it is frequently inconvenient to have the mantle of the chimney too low. However, the ſame effect may often be produced by another contrivance. For as the fire-place is uſually made wider than the length of the grate, a great deal of cool air paſſes at the two ſides of the grate without being much heated. This greatly diminiſhes the ſuction of the chimney: but it may eaſily be prevented by building up the vacancies at each ſide of the grate, ſo as to allow no air to enter from below, except what comes immediately through, or before the fire. For this purpoſe, grates conſiſting of a neat hewed ſtone at each end, with a breaſt and bottom of iron fitted to them, as repreſented at fig 2. are extremely convenient. But the aperture of the chimney is often not ſuddenly contracted above the mantle, but goes up tapering ſlowly, as in the ſame fig. 2. This ſtructure allows a quantity of cool air to enter at the two corners of the mantle, and ſteal up the tube without coming near the fire. The moſt eaſy and effectual method of remedying this defect, is to place a ſheet of milled iron within the mantle on each ſide, as low down as poſſible, making them ſlant a little upwards towards the middle of the chimney; as at A, fig. 2. the mantle being repreſented by the dotted line. By this contrivance, the air, which enters at the ſide of the mantle, before it can aſcend into the chimney, is forced to paſs very near the fire, and of courſe is much rarified. The good effects of this would be ſtill more ſtrongly felt, if one of theſe plates were placed a little lower than the other, and made ſo long, that the ends ſhould croſs each other, as at AB, fig. 2. by which means every particle of air that went up the chimney behoved to paſs immediately above the fire. It is almoſt unneceſſary to obſerve, that theſe plates ought to be ſo contrived as to be taken out at pleaſure to allow the chimney to be cleaned.

A chimney may not only be defective by having the mantle too high, or by being too wide from ſide to ſide, but alſo by being too deep between the fore ſide and the back, as is often the caſe in very old houſes. In this caſe, the diſtance between the fire and the mantle is ſo great, that much air paſſes up without being ſufficiently rarified, as is repreſented at fig. 3. This may be ſometimes cured by bringing the grate a little forward, which, by making the fire act more powerfully upon the mantle, rarefies the air more in its paſſage. But this can ſeldom produce the deſired effect, and it often does harm: for when the grate is brought forward, there is a great vacancy left between it and the back of the chimney, ſo that the air paſſes under the grate, and aſcends behind it very little rarified; ſo that, if the feet of grate are not very low, there will be as much loſt in this way as will be gained in the other; and as there is not enough of heated air in the chimneys of this kind to make the vapour aſcend with rapidity, they are often choaked with thick fuliginous vapours hanging in them, almoſt in equilibrio with the reſt of the atmoſphere, ſo that the leaſt puff of wind beats them down the chimney, and puſhes the ſmoke into the room; whereas, when it is far back, it is driven down upon the hearth, and riſes upwards again when the guſt is over, and a great deal of it is catched within the mantle as it riſes, which in the other caſe would have been diſperſed through the room. When this is the caſe, the moſt effectual method of cure is, to bring the grate forward till the forepart of it is immediately under the inner edge of the mantle; then build up the vacancy at the back of it, the whole width of the fire-place from ſide to ſide, raiſing it perpendicularly till it is as high as the back of the grate, and then bending it foreward towards the mantle, as is repreſented at fig. 4. When it is as high as the workman can reach, let it be ſuddenly turned backward again, ſloping a little upward, as in the figure; then fit a ſheet of milled iron to the inſide of the mantle, making it ſlant a little upward toward the back part, at a ſmall diſtance above the new-erected maſonry, and extending within a few inches of the back wall, as at A, fig. 4. By this conſtruction all the air that enters into the chimney is made to paſs immediately above the fire, between it and the heated iron, upon which the flame acts with the greater force, as the back of the fire-place is bent a little forward above the grate, and the heat is likewiſe reflected into the room with the greater force: at the ſame time, if the ſmoke is at any time beat down the chimney by a ſudden guſt of wind, it will be catched by the ſheet of iron, and prevented from coming into the room. If the fire-place be very wide between the the one ſide and the other, the new maſonry may be carried quite up to the ſheet of iron on each of the ſides.

3d, As every fire requires a conſtant ſucceſſion of freſh air, the tube for conveying this rarefied air to the higher regions of the atmoſphere muſt be of a ſufficient ſize to contain the whole of it, and allow it a ready paſſage; otherwiſe a part of it will be forced to ſeek ſome other paſſage; by which means, the apartment in which the fire is placed will be conſtantly filled with ſmoke. Every chimney therefore ought to have a degree of wideneſs ſufficient to carry off the whole of the ſmoke ariſing from the fire uſually burnt in it, otherwiſe the apartment will be almoſt continually filled with ſmoke.—This is a fault more common at preſent than any of thoſe already mentioned, eſpecially in large towns, where the number of chimneys in one wall is often ſo great that it is difficult to get a ſufficient ſpace for each. The moſt obvious cure, where the ſituation admits of it, is to widen the chimney, by opening a hole a little above the grate thro' the back-wall of the chimney, ſlanting a little upward, and building on the outſide of the wall a ſmall chimney open from that hole to the top of the building, as in fig. 5. where AB repreſents the new tube going through the wall at the opening at A, which will receive the ſuperfluous ſmoke, and carry it off. This additional chimney muſt always be carried as high as the other. But as there are many ſituations in which this method of cure would be impracticable, we muſt try every method for accelerating the aſcent of the ſmoke; (for the more quickly it aſcends, the more narrow may the tube be;) and with that view, the chimney may be heightened at top, and contracted at bottom, in any or all the various ways we have mentioned. But if none of theſe methods prove effectual, let the chimney be built quite cloſe at the under part, leaving only as much room as is ſufficient to contain the grate, having a cover of metal fitted to that opening

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pening, which can be taken off or put on at pleaſure; by which the whole air that enters into the chimney is made to paſs through the fire like a furnace, and carries the ſmoke up it with great velocity. Theſe are well known in large towns by the name *ſmoke-chimneys*: but as they occaſion a prodigious waſte of fewel without warming the room, and, unleſs attended with very great care, are in danger of ſetting the building on fire, they ought to be as much avoided as poſſible. But if neither this, nor any of the other methods prove effectual, the wall muſt either be taken down and rebuilt in a proper manner, or the chimney abandoned as incurable. As this is a defect more difficult to be remedied than any other, we would ſtrongly recommend it to every builder to build his chimneys of a ſufficient width throughout: there is no danger of erring on this extreme, as it is eaſy to remedy any defect that might ariſe from it.

4th, As the air which aſcends through the chimney continues nearly of an equal degree of heat to the top, the tube ſhould be of an equal degree of width at the top as at the bottom, as well as through the whole of its length. It ought not therefore to be made tapering gradually from the fire place to the top, but to be ſuddenly contracted above the grate, as in fig. 6. from which it ought to be continued of an equal wideneſs throughout its whole length; but if it is narrower at any one place than another, it ought to be at the under part, immediately above the fire, for a very ſhort ſpace; becauſe, as this is within reach of the hand, the ſoot can be cleaned from it as often as is neceſſary, ſo that when the other parts of the chimney are full and clogged with ſoot, they will not be narrower than this place is at that time.

5th, It ſeldom happens that a chimney can be carried quite ſtraight upwards: and it is an advantage that it is ſo, as they ought always to be bent a little. For if a chimney be ſtraight, and of a proper width to tranſmit the whole of the ſmoke and no more, it will not be ſufficient for that purpoſe, when there is a heavy fall of rain, or ſnow, or hail, with little wind; for the great drops will fall perpendicularly from the top to the bottom of the chimney and as they occupy a conſiderable ſpace, the ſmoke will not have room to aſcend, but muſt be forced down with the ſhower, and diſperſed in the apartment: whereas, if the chimney is bent, the rain falls upon ſome of the ſides, and glides gently down without diſturbing the aſcent of the ſmoke. The ſame inconvenience will be felt in a ſtraight chimney, where it is ſo placed as to be expoſed to winds, which ſometimes enter the top and blow down with a ſudden puff: for, if it be ſtraight, the air meets with no interruption till it deſcends into the chamber, and there diſperſes the ſmoke; but if it be crooked, the deſcent of the wind will be obſtructed, its force broken, and the bad effects of it in a great meaſure prevented. Upon the whole, bent chimneys are always preferable to ſtraight ones. However, a perpendicular chimney may be eaſily cured, by ſome of the contrivances after mentioned.

Theſe are the moſt general defects ariſing from the ſtructure of the chimney itſelf, which are all reducible to the following cauſes: 1. Too little height; 2. Too great wideneſs of the bottom of the chimney; 3. Too little width; 4. Unequal wideneſs between the top and bottom; and, 5. Straightneſs of the tube. We have pointed out the beſt methods of curing each of theſe defects; and to finiſh our remarks on this general head, and give the reader a more perfect idea of the beſt form of conſtruction for a chimney, we have drawn two different ſections of one conſtructed on the juſteſt principles, in figures 6. and 7. the ſeveral parts of which appear ſo plain from the figures, and the reaſons for this conſtruction have been already ſo clearly aſſigned, that a very ſhort explanation will be ſufficient. Figure 6. repreſents a front-view of the fire-place; ſuppoſing the fore-part of the wall taken down, and the chimney laid bare from top to bottom; AB, and DC, repreſenting the two ſides of the fire-place; and BC, the mantle, being cut through, to ſhew the manner in which the aperture is ſuddenly contracted, immediately above the fire within the mantle. The tube from the point E, to the top, ought to be of an equal wideneſs, and bent in any direction that may be convenient. The two planes, F F, repreſent the two ſides of the fire-place, which ought to be as much ſloped inward towards the back as the form of the grate will admit of; for the more they are inclined, the more powerfully will they reflect the heat into the apartment. Fig. 7. repreſents a perpendicular ſection of the wall, through the middle of the chimney, to diſcover its ſhape, if viewed from a ſide. And here it is to be obſerved, that it ought ever to be a rule to bring the building at the under part of the chimney immediately behind the grate, as far forward as poſſible, becauſe this throws more heat into the chamber than if it were placed farther back: but as the fore-part of the grate ought never to project beyond the inner edge of the mantle, care ſhould be taken to have the under part of the mantle wrought as thin as the nature of the materials will admit of, making it thicker towards the upper part ſo as to ſlope inwards above the fire, as repreſented at B, fig. 7. To throw the heat outward, let the upper part of the back of the fire-place be a little inclined outward, as at C; but, after it is carried up in this manner a little higher than the mantle let it be ſuddenly turned back, as in the figure, the projection above the mantle inclining backward in the ſame direction, being carried up to the top at an equal wideneſs the whole way.

Although it is neceſſary to have all chimneys pretty wide; yet this, on many occaſions, is attended with inconveniences: for as they tranſmit a great quantity of heated air, too large a portion of that warm air which ought to heat the chamber is carried off; and as it is only when the fire is firſt kindled that the great quantity of groſs vapour is exhaled which fills the chimney, and maketh a large tube neceſſary, if it were ſo contrived as to contract or dilate at pleaſure, we might have our chimney of a ſufficient width to convey away the greateſt quantity of ſmoke that could ever have occaſion to paſs through it, at the ſame time that we might never allow more air to paſs off at other times than was neceſſarry to carry away the whole of the ſmoke, by which means a much ſmaller quantity of fewel would keep our apartment equally warm. This we apprehend might be accompliſhed by the following ſimple apparatus. Let a ſheet of milled iron be fixed at the upper part of the mantle, on the inſide, at B, in ſuch a manner, as that, by means of a ſmall wire *de*, paſſing through a ſmall hole left for that purpoſe in the fore-part of the chimney, it might be let down at pleaſure towards C, or drawn up towards B; ſo as to apply quite cloſe to the upper edge of the chimney between B and C. This would leave the tube of its

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its full widneſs when neceſſary, or cloſe it to any degree at pleaſure, with the greateſt eaſe *. It is unneceſſary to add, that the plate at A fig. 4. might be employed in the ſame manner, when it ſhould be found convenient. So much for what relates to the conſtruction of the chimney itſelf. We now proceed to conſider the ſecond general cauſe of ſmoke, *viz.*

II. Of ſmoky houſes proceeding from faults of other parts of the building, altogether independent of the ſtructure of the chimney itſelf.

1ſt, The firſt we ſhall mention is too great cloſeneſs of the room. Smoke, as ſhewn above, is impelled up the chimney by the preſſure of the air entering at the fire-place and aſcending upwards; but, if freſh air is not admitted into the apartment in ſufficient quantities to ſupply the conſumption by the fire, the room will be quickly exhauſted, and the air in it become as light as the external air at the top of the chimney, ſo that the ſmoke will as readily be diſperſed into the chamber as through the chimney. But if any door or window is opened ſo as to admit plenty of free air, the ſmoke will be quickly diſpelled, and the proper circulation eſtabliſhed: the ſame effect will be produced by making a ſmall hole in ſome of the ſides of the room; but unleſs this be done with ſome judgment, it may frequently add to the diſeaſe, as it may concur with ſome of the other cauſes of ſmoky houſes, to be afterwards mentioned. A better method of remedying this evil would be to have a ſmall hole made in the wall at the back of the chimney, and immediately underneath it: or a ſmall perforation, made in the wall in any other convenient manner; the one end of which ſhould communicate with the external air, and the other communicate with the chamber in any place near the grate, and as low down as poſſible, through which a conſtant ſupply of air would be adminiſtered to the fire without the ſmalleſt inconvenience or trouble. If this were practiſed, doors and windows might with ſafety be made much cloſer than at preſent, and our apartments rendered equally warm and comfortable with a much ſmaller quantity of fewel than we uſe at preſent. For as the fire, in the preſent mode of conſtructing chambers, is kept alive by a conſtant ſucceſſion of cold air from the doors, windows, and other crannies of the room ruſhing towards the chimney in all directions, the air of the room, which, if not cooled by this means, would be quickly heated to a great degree, is conſtantly kept cold in ſpite of the ſtrong heat of a blazing fire; which, at the ſame time that it ſcorches the parts of our body which are moſt expoſed to it, does not warm the parts which are turned from it; and we experience at the ſame time a burning heat and piercing cold, which is often productive of the moſt diſagreeable effects. But if the fire were ſupplied with air in the manner abovementioned, there would be leſs air drawn in through the crannies of the room, ſo that the air within would be ſoon warmed, and continue long ſo even with a ſmall degree of heat. However improper this might be for people in perfect health, it might ſurely be of great uſe for thoſe who are in a weakly habit of body; eſpecially if care were taken to carry off the foul air, by having a ſmall tube leading from the upper part of the room to the top of the houſe, through which the air which had been rendered noxious by the ſmoke of candles or perſpiration would be conveyed away, and a ſucceſſion of freſh air admitted from the tube near the fire-place to ſupply that want. That the reader may more readily comprehend what is here meant, we have repreſented in fig. 6. a view of two ſmall tubes for this purpoſe ſuppoſed to be laid open by taking away the boxing or inner coating of the wall which ought to cover them. Theſe are of wood, and muſt not be above one inch in diameter. One end, *g g*, goes quite through the outer wall of the houſe, and communicates with the open air, having a ſmall grate upon it to prevent vermin from entering. The other end, *h h*, paſſes behind the two ſlabs at the ſide of the fire-place, and open in the inſide of the fire-place at *i i*, at which place they have each of them a ſmall bit of braſs fitted to them, being cloſed with two ſliding doors exactly like thoſe that are uſed to cover the end of teleſcopes, by means of which more or leſs air may be admitted at pleaſure.

2d, A ſecond cauſe of ſmoke, is the wrong poſition of doors and windows, with reſpect to the fire-places.

As the ſmoke is impelled up the chimney by the preſſure of the air, if that air is driven away from the fire-place by any cauſe more powerful than the ſuction occaſioned by the fire, the ſmoke muſt alſo be drawn away with it, and follow the ſame directions with that current of air; ſo that whatever tends to draw a current of air from the under part of the chimney, will alſo tend to produce ſmoke in the houſe; from whence it is eaſy to conceive how doors or windows may occaſion ſmoke when the wind is in certain directions. Thus, ſuppoſe a chamber, A, B, C, D, fig. 8. having a door or window at E, another at F, and a fire-place at G; when the wind is in the direction D A or C B, the general current of air will occaſion a ſort of ſuction at the opening E, ſo that the air will be drawn from the chimney G towards E: and if the current be ſtrong, and the opening at E large, it will become more powerful than the ſuction of the chimney, and produce ſmoke in the apartment. If the window at F ſhould be opened in this caſe, it would not mend the matter; for any wind which ſhould enter at F, would be carried ſtreight out at the opening E, and the current of air would be drawn from the chimney as ſtrong as ever. If the window at E were ſhut, and that at F left open, and the wind ſtill continued in the ſame direction as before, the current of air ruſhing paſt the window would have a tendency to draw the air of the room along with it, and

* If any one ſhoud think, that the wire *d* would be a diſagreable object in the middle of a chimney-piece, it might eaſily be hid by a picture of any kind. The wire might be fixed to a ſmall braſs-handle moving freely upward and downward like that for a bell; only this ſhould have a long ſlit in the middle of it, with notches on each ſide, to receive a pin placed in the middle of the ſlit, by means of which the wire might be lengthened or ſhortened at pleaſure. The whole of this apparatus is repreſented at fig. 16. where (*a*) repreſents the wire faſtened to the braſs-plate; (*b*) a piece of braſs, raiſed a little, to ſerve as a handle. The ſlit in the middle is repreſented by the dark line, having notches *c c c* at convenient diſtances. The pin *d* is fixed into the wall, but left at liberty to turn about with eaſe; and its head ſtands up a little, ſo as to be eaſily turned with the finger and thumb. The body of this nail is made ſo thin in one direction, that when it is turned half round, it eaſily paſſes through the ſlit in the plate; but in the other direction its diameter is greater, ſo that when the plate is brought ſo as to have one of the notches oppoſite to the nail, and it is then turned half round, it catches the plate ſo that it cannot be moved till the nail is again turned about.

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and occaſion ſmoke, but not ſo powerfully as if the window at E were open; but if the wind were in the direction D B, it would be very bad: but if it blew in the direction C A, the caſe would be very much altered; for then a quantity of air being forced in at the opening F, and finding no ready paſſage, it would be pent up in the chamber, and force itſelf up the chimney with violence. We omit mentioning what would be the effect if the wind were in other directions, as it is imagined theſe will be ſufficiently obvious to every attentive obſerver. It is only neceſſary here to obſerve, that as doors or windows are ſeldom ſo exactly made, but they produce ſome effect, as they always admit ſome air even when ſhut, and often occaſion ſmoke when the wind blows from a particular quarter; and as workmen and others generally apprehend, when houſes are troubled with ſmoke in this manner, that it is occaſioned by ſome external cauſe, and apply their attention to cure it by altering the top of the chimney, which never can produce the ſmalleſt ſervice in this caſe; we would recommend a more particular attention to be paid to the ſituation of doors and windows than is generally beſtowed, eſpecially in ſuch ſituations where they are expoſed to any violent current of air in a particular direction, as in narrow lanes, or defiles of any ſort, where the wind, when in particular directions, is hurried along with a prodigious rapidity. And, that the effects of different poſitions may be ſtill more obvious, we ſhall produce ſeveral other examples.

Suppoſe a chamber, fig. 9. having a door at A, and two windows B C, with a fire place D. If the wind came in the direction DA, and if the door tranſmitted as much or more air than was admitted at both the windows, a current of air would run from all parts of the chamber towards A, and therefore would have a tendency to occaſion ſmoke: but if as much or more air came in at the windows than could get out at the door, there could be no ſuch current; but, on the contrary, it would be forced up the chimney, and carry the ſmoke along with it: wherefore in this ſituation, a room might ſometimes be cured of ſmoke, by making the door as cloſe as poſſible; nothing could be more hurtful in this caſe than boring a hole in the door. But if the houſe was in ſuch a ſituation as to be more frequently expoſed to a wind which came in the direction of AD, it would run little riſk of being troubled with ſmoke.

Suppoſe a room, fig. 10. having a door at A, and two windows B and C, with a fire-place D. If the wind came in the direction CB or BC, and both the windows were open, it is evident that the ſmoke would be drawn from the chimney by the ſtrong current of air paſſing through the room; or if the window upon which the wind came were cloſed, and the oppoſite one open, nearly the ſame effect would be produced: but if the window upon which the wind blew were open, and the oppoſite one and the door ſhut, the room would be immediately cleared of ſmoke entirely. In this ſituation, it is evident, that if the windows were badly made, ſo as to admit much air, it would tend to occaſion ſmoke, eſpecially if the door were in the ſame ſituation; it is therefore of conſequence to attend to this circumſtance in a ſituation ſimilar to this.

Having premiſed ſo much with regard to ſingle rooms, we ſhall now proceed to conſider a more compound ſtructure. Thus, let fig. 11. repreſent a building conſiſting of two chambers, K L, joined by a paſſage. The chamber K having a door B communicating with the paſſage, a window F, and fire-place G; and that at L having a door C, another door or window D, the window E, and fire-place H, the entry to the whole being by the door A. Let us now conſider what would be the effect of the wind coming from different directions upon this building. And firſt, ſuppoſe the wind blew in the direction AM: If all the doors and windows were cloſe ſhut, and very little air were admitted, there would be little riſk of ſmoke; but as there would ſurely be ſome admitted through theſe different openings, there would be ſome chance that the chamber L would be troubled with ſmoke, becauſe of ſome the air which forced its paſſage through the chinks of the door A would paſs through the doors C and D, which might produce ſmoke in a ſmall degree. There would be little chance that the chamber K would ſmoke in this caſe; becauſe although there is a general ſuction through the paſſage from B to D, yet as it is in ſome meaſure interrupted by the cloſe door at C, it will be but ſmall; and as the wind is interrupted in its courſe by the wall of the paſſage, ſome of it will be forced through the chinks of the window F, which would more than counterbalance the effects of the other ſuction. But if the door D were open, both the chimneys would ſmoke; eſpecially if the doors B and C were open alſo, as the current would be then very ſtrong towards that point. But in all caſes the ſmoke of this houſe would be prevented by keeping the door at D ſhut, and that at A open; but if the houſe was in ſuch a ſituation as to be more expoſed to that wind than any other, it would be better to cloſe up the door D altogether. If the wind more commonly came from M towards A, it is more than probable that a houſe ſituated like this would be quite free of ſmoke, as the general current of air would be towards the chimneys; but the chamber K would run greater riſk than L, as the ſuction might ſometimes be drawn towards the window F; but if the door A were in the oppoſite ſide of the paſſage, that inconvenience would be avoided alſo. If the more general current of air were from K towards L, this houſe behoved to be troubled with ſmoke unleſs the windows were very cloſe: but there would not be the ſmalleſt chance for that, when it came from L towards K.

We might now proceed to give more examples of this ſort: but as it would be impoſſible to enumerate all the variety of caſes that might occur, it is imagined that theſe will be ſufficient to give the reader an idea of the manner in which any building ought to be examined in this reſpect; and he muſt be left to his own diſcretion to apply the principles above explained to all the variety of caſes that may occur. In large complicated buildings, it no doubt requires a greater extent of thought to combine all the various circumſtances together, and draw a general concluſion, than in ſmaller and more ſimple ones; but if the following general rules are attended to, the complaints ariſing from this cauſe would be but few. 1ſt, Avoid as much as may be long paſſages leading to very diſtant parts of a building, as there is often a ſtrong current of air in theſe which helps to diſturb the free circulation of air up the chimneys. 2d, Place the chimneys in general in that ſide of the apartment *towards* which the wind which in general prevails moſt in the ſituation where the houſe is placed blows: And, 3d, make as many, if not more, doors and windows (eſpecially ſuch as have occaſion to be moſt frequently open) on that ſide of the building *from whence* the moſt prevalent wind does come.

IIId. The third general cauſe of ſmoke in houſes is the

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wrong poſition of the houſe with regard to external objects, which, by interrupting the courſe of the air, makes it aſſume various directions, and wheel about in eddies, ſo as to prevent it from aſcending with eaſe from the chimney top, or beats it down into the room with violence. This is more ſeldom the cauſe of ſmoky houſes than either of the two before mentioned; although it ſeems to be almoſt the only one attended to by the perſons who pretend to cure ſmoky houſes at preſent, as moſt of their remedies are adapted to remove the diſorders ariſing from this cauſe alone. We ſhall briefly point out the ſeveral caſes in which this can occur, that every one may be enabled to judge for himſelf when theſe cures are proper or not.

The air (as has been ſaid) is a fluid, and wind a current of that fluid; which, when driven along the ſurface of the earth, flows with a ſmooth and equal ſtream, unleſs when oppoſed by ſome object which interrupts its courſe; but when it meets with any object which directly oppoſes its courſe, it is in ſome meaſure puſhed back again, and made to ſpread on every ſide, till it meets with ſome open ſide, towards which it flows with great impetuoſity. It is likewiſe a fluid of conſiderable gravity, and therefore preſſes upon the ſurface of the earth with great force; ſo that, when a current of it flows along the ſurface of our globe, it has a tendency to move forward and preſs downward at the ſame time: from whence it happens, that when a current of air is forced over the top of any high object, the ſide of which deſcends perpendicularly downward, the velocity of the current at firſt overcomes the gravity, and it flies a ſhort way over in that direction; but the power of gravity acting upon the under ſurface, draws it downward, and in a ſhort time overcomes the impetus that it had to ruſh forward, and occaſions a ſort of eddy nearly ſimilar to what we ſee among water behind a ſtone which interrupts the violence of its currents.

To illuſtrate this more plainly, let AB, fig. 12. repreſent a part of a high building, near to which is a ſmaller one CD; and let the dotted line EF repreſent a current of air flowing with conſiderable force in the direction FE. It is plain that it will flow ſtraight forward over the top of the ſmall building; but when it meets with the large object, it will be interrupted in its courſe, and ſpread itſelf on every ſide, as repreſented by the dotted lines GG *&c.* at laſt it will flow towards that place through which it can eſcape with the greateſt eaſe. If the oppoſing object be large, and has no opening through which it can iſſue near the ground, then it will aſcend to the top of it, and flow off in that direction, carrying the ſmoke which aſcends from the ſmall chimney C along with it: but if there is any opening below, either a ſtreet or lane, or any other paſſage that will admit the wind to paſs, then will the natural gravity of the air draw the general current downward to flow off through the lower paſſage; in which caſe, the ſmoke which ought to aſcend through the chimney C, meeting with a current of air oppoſing its paſſage, will not be at liberty to iſſue forth, but be forced back again into the room from whence it proceed, unleſs ſome contrivance is fallen upon to prevent it.

Again, let A, fig. 13. repreſent a ſmall building at the ſide of a great rock B, and the wind coming in the direction C D; when the current of air comes to the point D, being hurried forward with great velocity, it goes a little forward, but ſoon deſcends downward, and gradually is reflected more and more inward, as repreſented by the dotted lines E E, *&c.* ſo that, deſcending downwards upon the top of the chimney A, the ſmoke is beat back again into the apartments. Thus it is that low houſes, when contiguous to high objects, are in danger of being diſturbed with ſmoke. If the contiguous object be not very high, the diſorder may be cured by heightening the chimney of the low houſe, but if it is very high, it will be neceſſary to cover the top of the chimney in ſuch a manner as to prevent the wind from entering it, at the ſame time that a paſſage is left at ſome of the ſides through which the ſmoke may iſſue with freedom. Many are the contrivances which have been invented for this purpoſe, which are to be met with every where; and as there is no difficulty in accompliſhing the deſired end by an infinite variety of methods, every one who needs ſuch a thing may pleaſe his own fancy in the choice. We have thought it unneceſſary to add any more but one kind of theſe, fig. 14. which will anſwer the end effectually.

It is evident that houſes ſituated near high hills, or thick woods, will be in ſome meaſure expoſed to the ſame inconvenience; but it is likewiſe plain, that if a houſe be ſituated upon the ſlope of a hill, as at F, fig. 13. it will not be in any danger of ſmoke when the wind blows towards that ſide of the hill upon which it is ſituated; for the current of air coming over the houſe-top in the direction G H, is immediately changed by the ſlope of the hill to the direction H C, which powerfully draws the ſmoke upward from the top of the chimney. But it is alſo evident, that a houſe in this ſituation will be liable to ſmoke when the wind blows *from* the hill; for the current of air coming downward in the direction C H, will beat downward on the chimney F, and prevent the ſmoke from aſcending with freedom. But the effect will be much heightened, if the doors and windows are chiefly in the lowermoſt ſide of the houſe.

Theſe are ſome of the moſt general circumſtances which prevent the free aſcent of ſmoke, ariſing from external objects: but there are many other leſſer cauſes which may at times occaſion ſmoke, all of which it would be tedious here to enumerate; ſuch as, blaſts of air, reflected from the ſides of mountains, and coming down valleys with great impetuoſity, occaſioning, in particular ſituations, eddies or whirlwinds of different ſorts. In ſhort, whatever in any meaſure diſturbs the free motion of the air, is in danger of producing ſudden guſts, which may occaſion ſmoke. Therefore, whoever builds in a ſituation which is not altogether free, may lay his account with having ſome ſudden guſts of ſmoke, unleſs he forms the top of his chimney ſo as to obviate it. And there are ſome ſituations ſo much expoſed to ſudden guſts of wind, ſometimes whirling round, ſometimes beat ſuddenly downward, or as ſuddenly carried up again, that it is difficult to guard againſt every danger. In theſe ſituations we would recommend ſomething of the form of what is repreſented at fig. 15. which would be proof againſt every wind whatever.

Having thus traced the cauſes of ſmoky houſes, and reduced them to diſtinct claſſes for the ſake of diſtinctneſs: it is neceſſary, before we quit this ſubject, to obſerve, that in many caſes, two or more of theſe may be combined to augment the malady, and therefore it is neceſſary to have all theſe circumſtances in view in every particular caſe. It now only remains that we point out the ſeveral phenomena which may lead us to diſtinguiſh from which of theſe general cauſes the diſorder complained of may proceed. And,

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Plate CLVI.

Fig. 1.

Fig. 2.

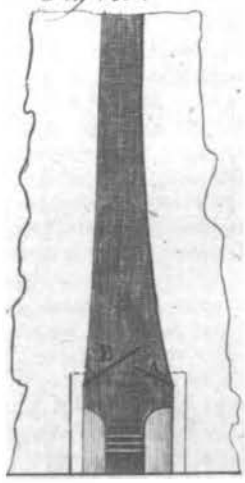

Fig. 3.

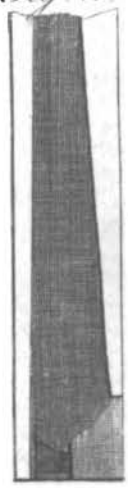

Fig. 4.

Fig. 6.

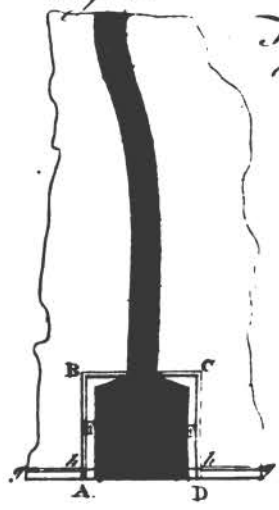

Fig. 7.

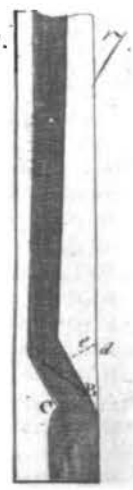

Fig. 5.

Fig. 8.

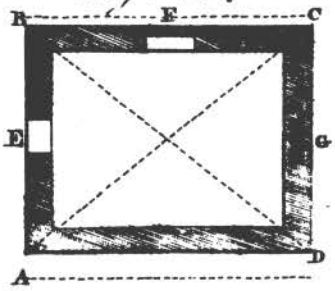

Fig. 9.

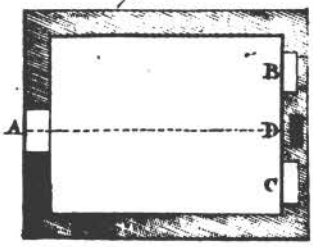

Fig. 10.

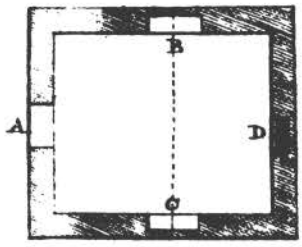

Fig. 11.

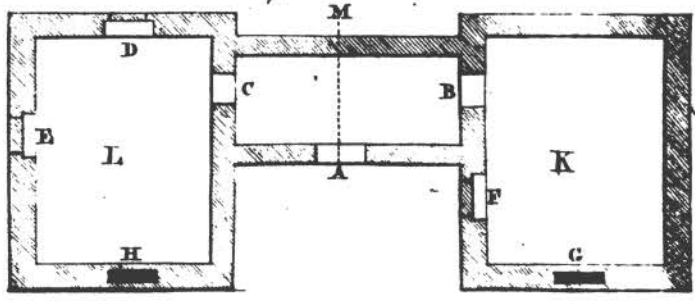

Fig. 16.

Fig. 12.

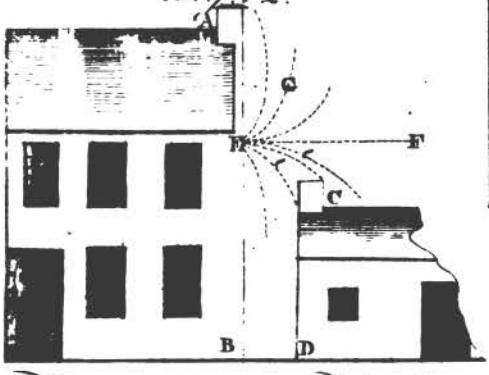

Fig. 13.

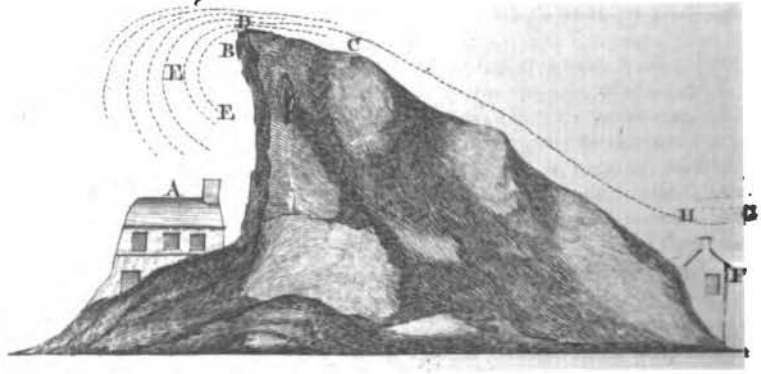

Fig. 14.

Fig. 15.

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1ſt, If it is owing to a fault in the conſtruction of the chimney itſelf, it will ſmoke almoſt continually, eſpecially in calm weather.

2d, If it does not ſmoke in calm weather, or only when the wind comes from ſome particular quarter, and can then be cured by opening ſome door or window, the fault may be looked for in the diſtribution of the doors or windows of the houſe. The only caſe in which there is a difficulty to diſtinguiſh whether it is owing to the fault of the chimney or the houſe, is when it proceeds from too much cloſeneſs of the apartment. But this may be eaſily known by trying it in a calm: for if it proceeds from this cauſe, there will be no ſmoke in a perfect calm, if the doors are left open; whereas, if the defect proceeds from a fault in the chimney itſelf, it will ſtill continue to ſmoke when calm, even when the doors are open.

3d, When the ſmoke is occaſioned by external cauſes, theſe can be generally ſeen; but it may be likewiſe known by this, that it deſcends in ſudden puffs with great violence at times, even when the doors and windows are not altered. By attending to theſe few rules with care, there will be little danger of miſtaking the cauſe from whence this diſorder proceeds.

We ſhall conclude theſe obſervations with a few remarks on ſome particular caſes which can hardly be reduced to any of the foregoing heads. And,

1ſt, It ſometimes happens, that the ſmoke is prevented from aſcending with freedom, by having a ſmall part of the top of the chimney broke down, ſo as that ſome parts of it remain higher than others, which in ſome meaſure reduces it to the ſtate of a chimney at the ſide of a higher one. To prevent this, it is always proper to have the top of the chimney finiſhed with ſtones neatly cut, and firmly built. It is not to be doubted but that thoſe things which are placed upon particular chimneys with a view to cure them of ſmoke, do often, from the ſame cauſe, hurt the neighbouring chimneys built in the ſame wall.

2d, A chamber is ſometimes filled with ſmoke, when a fire is kindled in a neighbouring chimney, and none in it, although there is no appearance of ſmoke when it has a fire burning in its own grate. This may ſometimes proceed from a ſmall hole breaking through the thin partition that divides the two chimneys from one another; and as ſmoke is a weighty body, which is only buoyed up by the warm air which paſſes through the fire, when it penetrates into the cold chimney it naturally ſubſides, and comes down to the chamber with which the chimney communicates, when there is no fire to carry it off. But this diſeaſe is generally produced by the ſmoke entering at the top of the chimney, and deſcending downwards: if this laſt is the caſe, it may be cured, on many occaſions, by ſetting a pretty high ſtone at the top of the chimney, as a diviſion between each two: but the ſureſt method, in all caſes, is to have a ſmoke-board exactly fitted into the chimney above the grate, which on all occaſions effectually prevents it.

3d, It frequently happens, that a chimney does not carry off the ſmoke well at firſt when the fire is kindled, although there is not the ſmalleſt tendency to it at other times. This proceeds from the narrowneſs of the chimney; for when the fire is kindled, the whole tube is filled with cold air, as weighty as that in the appartment; and being expanded by the fire at the bottom; it endeavours to aſcend upward, but being pent in by the narrowneſs of the tube, and preſſed by the column of cold air above it, it is ſome time before it can wholly overcome that reſiſtance, and ſome of it is forced into the chamber, till by degrees the whole chimney is heated, and then it vents quite well. If the ſmoke produced by this means is not very troubleſome, it may be borne with; but if it be extremely diſagreable, it may be cured by having a large ſheet of milled iron, large enough to reach between the two ſides of the fire-place, and as deep as to reach from the mantle to the grate, or lower, which might by any contrivance be hung up before the fire at that time to act in ſome meaſure as a *ſmoke-chimney*. This would quickly make the fire burn, and carry of the ſmoke entirely. After that is effected, it might then be removed, till another occaſion.

SMOLENSKO, the capital of a province of the ſame name in Muſcovy, ſituated on the confines of Poland: in E. long. 33°, and N. lat. 56°.

SMUGGLERS, in law, thoſe perſons who conceal or run prohibited goods, or goods that have not paid his Majeſty's cuſtoms.

SMUT, in huſbandry, a diſeaſe in corn, when the grains, inſtead of being filled with flour, are full of a ſtinking black powder.

There are two remedies for the ſmut, recommended by writers on huſbandry; *viz.* ſteeping the ſeed in ſalt brine, and changing the ſeed.

As to the ſteeping of ſeed, when wheat is intended for drilling, it muſt be ſoaked in a brine of pure ſalt, diſſolved in water, ſince urine is found to be highly prejudicial. The moſt expeditious way of brining wheat for drilling, is to lay it in a heap, and waſh it with a ſtrong brine ſprinkled on it, ſtirring it up with a ſhovel, that it may be all equally brined, or wetted with it; after this, ſift on ſome fine lime all over the ſurface, and ſtir it up, ſtill ſifting on more in the ſame manner till the whole is duſted with the lime: it will then be ſoon dry enough to be drilled without farther trouble. It muſt be quick-lime, in its full ſtrength, that is uſed on this occaſion.

The bread made of ſmutty corn, is very pernicious, acting as a narcotic, and occaſioning not only ſleepineſs, but vertigoes, and even convulſions.

SMYRNA, a city and port-town of Aſiatic Turky, ſituated on a bay of the Archipelago, in the province of Ionia, in Leſſer Aſia, 100 miles north of Rhodes, and 200 miles nearly ſouth of Conſtantinople: E. long. 27°, N. lat. 37° 30'.

SMYRNIUM, in botany, a genus of the pentandria digynia claſs. The fruit is oblong, and ſtriated; and the petals are ſharp-pointed, and carinated. There are five ſpecies, only one of them, *viz.* the oluſatrum, or alexanders, a native of Britain.

SNAFFLE, in the manege, is a very ſlender bit-mouth, without any branches, much uſed in England; the true bridles being reſerved for the ſervice of war.

SNAIL, in zoology. See LIMAX.

SNAKE, in zoology. See ANGUIS.

SNAKE-ROOT, in botany. See POLYGALA.

SNAKE-WEED, in botany. See POLYGONUM.

SNAPDRAGON, in botany. See ANTIRRHINUM.

SNEEZING, a convulſive motion of the muſcles of the breaſt, whereby the air is expelled from the noſe with much vehemence and noiſe.

Sneezing is cauſed by the irritation of the upper membrane:

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brane of the noſe, occaſioned by acrid ſubſtances floating in the air, or by medicines called ſternutatories.

SNETHAM, a market-town of Norfolk, twenty-eight miles north-weſt of Norwick.

SNIPE, in ornithology. See TANTALUS.

SNOW, a meteor produced in this manner: When the vapours are become conſiderably condenſed, yet not ſo far as to be liquified, or diſſolved into water; then, by a ſpecial degree of coldneſs in the upper region of the air, the particles of the condenſed vapour are changed into ice; ſeveral of which adhering together, form little fleeces of a white ſubſtance, ſomewhat heavier than the air; and therefore deſcend in a ſlow and gentle manner through it; being ſubject, by reaſon of its lightneſs, to be driven about by the various motions of the air and wind; and is what, when arrived to the ſurface of the earth, we call ſnow.

Snow fructifies the ground; for inſtance, by guarding the corn or other vegetables from the intenſer cold of the air, eſpecially the cold piercing winds.

SNOWDON-HILL, the higheſt mountain in Wales, ſituated in Caernarvonſhire.

SNOW-DROP, in botany. See GALANTHUS.

SNUFF, a powder chiefly made of tobacco, the uſe of which is too well known to need any deſcription here.

SOAL-FISH, in ichthyology. See PLEURONECTES.

SOAP, a kind of paſte, ſometimes hard and dry, and ſometimes ſoft and liquid, much uſed in waſhing, whitening linens, and by dyers, fullers, *&c.* See CHEMISTRY, p. 93, 149, 154.

The purer hard ſoap is the only ſort intended for internal uſe. This, triturated with oily or reſinous matters, renders them ſoluble in water; and hence becomes an ingredient in pills compoſed of reſins, promoting their diſſolution in the ſtomach, and union with the animal fluids. Boerhaave always preſcribed ſoap in reſinous pills, unleſs where an alkaleſcent or putrid ſtate of the juices forbad its uſe. From the ſame quality, ſoap ſeems well fitted for diſſolving oily or unctuous matters and viſcidities in the human body; thereby opening obſtructions, and deterging all the veſſels it paſſes through. It is likewiſe a powerful menſtruum for the calculus, or ſtone in the bladder; a ſolution of it in lime-water being one of the ſtrongeſt diſſolvents that can with ſafety be taken into the ſtomach: the virtue of this compoſition is conſiderably greater than the aggregate of the diſſolving powers of the ſoap and lime-water when unmixed.

SOCAGE, an ancient tenure, by which lands were held on condition of ploughing the lord's lands, and doing the operations of huſbandry, at their own charges.

SOCCUS, in antiquity, a kind of high-ſhoe, reaching above the ancle, worn by comedians, as the cothurnus was by tragedians.

SOCIETY, in general, denotes a number of perſons united together for their mutual aſſiſtance, ſecurity, intereſt, or entertainment.

The ſocial principle in man is of ſuch an expanſive nature, that it cannot be confined within the circuit of a family, of friends, of a neighbourhood: it ſpreads into wider ſyſtems, and draws men into larger communities and commonwealths; ſince it is in theſe only, that the more ſublime powers of our nature attain the higheſt improvement and perfection of which they are capable.

Royal SOCIETY, an academy or college, eſtabliſhed by charter, by king Charles II. for promoting natural knowledge, and uſeful arts, by experiments.

It conſiſts of ſeveral hundred fellows, or members, moſtly Britiſh; ſome perſons of the higheſt rank, and many eminent gentlemen and learned men of other nations. Their meetings are held once a week, at their houſe in Crane-Court, Fleet-ſtreet, London; where they diſcourſe upon the productions and rarities of nature and art, and conſider how the ſame may be improved for the good of mankind: here are alſo read letters, and other philoſophical papers ſent by ingenious perſons both at home and abroad; upon which they diſcourſe in the plaineſt manner, without affecting ſtudied ſpeeches.

This ſociety, of which his Britannic majeſty is perpetual patron, is governed by a council of twenty-one members; ten of whom are yearly choſen out of the ſociety, on St. Andrew's-day. The chief of the council bears the title of preſident, whoſe proper office is, to call and diſſolve the meetings; to propoſe the matter to be debated; call for experiments; and admit ſuch members as ſhall be elected, which muſt be by a majority of at leaſt twenty-one votes; whereupon he is admitted, after paying 40s. and ſubſcribing that he will endeavour to promote the good of the Royal Society of London by the improvement of natural knowledge; and being thus admitted, he afterwards pays 13s. a quarter, as long as he continues a member of the ſociety.

SOCIETY *for the encouragement of arts, manufactures, and commerce.* The public ſpirit of this age is no-where more remarkably ſhewn, than in the flouriſhing condition of this valuable ſociety, whoſe object is the improvement of the polite, uſeful, and commercial arts, in all their various branches, by exciting induſtry and emulation among all who can be ſtimulated by honorary or pecuniary rewards. It was ſet on foot in the year 1753, by the Lord Folkſtone, Lord Romney, Dr Hales, and ſeven or eight private gentlemen, who were brought together by the unwearied pains of Mr William Shipley, who had long laboured to reduce into practice a ſcheme he had formed for this purpoſe. This ſociety, at their ſecond meeting, determined to make a beginning, by propoſing rewards for the diſcovery of cobalt, for the encouragement of boys and girls in the art of drawing, and for the planting of madder in this kingdom. And now money being wanted, a voluntary ſubſcription was begun; ſoon after which a plan was drawn up for forming, regulating, and governing the ſociety: and now the utility of ſuch a ſociety became ſo well underſtood, that immediately ſeveral noblemen and gentlemen offered themſelves as members; and ever ſince that time, its increaſe has been ſo extraordinary, that it conſiſts of ſeveral thouſand members, among whom are moſt of the nobility, and perſons of large fortunes in the kingdom. The officers of this ſociety are, a preſident, eight vice-preſidents, a regiſter, a ſecretary, and an aſſiſtant-ſecretary, who are all choſen by ballot annually on the firſt Tueſday in March. Every perſon deſiring to be a member of this ſociety muſt be propoſed by three members: his name, addition, and place of abode, being read aloud by the ſecretary, he is ballotted for at the next meeting: he ſhall be deemed a perpetual member upon payment of twenty guineas, or a ſubſcribing member upon payment of any ſum not leſs than

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than two guineas annually. Ladies are alſo admitted members, and foreigners are likewiſe admitted as honorary or correſponding members. The money of the ſociety is placed in the bank of England, in the name of the preſident and vice-preſidents, three of whom are empowered to draw any ſum the ſociety ſhall order to be paid. The ſociety's office is oppoſite to Beauford buildings in the Strand, in London, where their meetings are held every Wedneſday evening, from the ſecond Wedneſday in November, to the laſt Wedneſday in May, and at other times every firſt and third Wedneſday of every month.

SOCIETY *for the reformation of manners*, and putting in execution the laws againſt immorality and profaneneſs. It was ſet on foot about forty years ago, by five or ſix private perſons in London, but is ſince exceedingly increaſed by numbers of all denominations. A particular body of the moſt conſiderable hereof, bear the expence of proſecutions, *&c.* without any contribution from the reſt. Theſe chiefly apply themſelves to the proſecuting people for ſwearing, drunkenneſs, and prophaning the ſabbath. Another body, of about fifty perſons, apply themſelves to the ſuppreſſing lewdneſs, and by them above five hundred lewd houſes have been actually ſuppreſſed; a third body conſiſts of conſtables; and a fourth of informers. Beſides theſe, there are eight other regular mixed bodies of houſe-keepers and officers, who inſpect the behaviour of the conſtables and other officers, aſſiſt in ſearching diſorderly houſes, ſeizing offenders, giving information, *&c.* There are ſeveral other ſocieties of this kind at Briſtol, Canterbury, Nottingham, *&c.*

SOCIETY *for propagating the goſpel in foreign parts*, was inſtituted by king William, in 1701, for ſecuring a maintenance for an orthodox clergy, and making other proviſions for the propagation of the goſpel in the plantations, colonies, frontiers, *&c.* To that end he incorporated the archbiſhops, ſeveral biſhops, and other nobility, gentry, and clergy, to the number of ninety, with privilege to purchaſe two thouſand pounds per year, inheritance and eſtates for lives or years, with other goods to any value. They meet yearly on the third Friday of February, to chuſe a preſident, vice-preſident, and other officers; and the third Friday in every month to tranſact buſineſs, depute fit perſons to take ſubſcriptions for the ſaid uſes, and of all moneys ſo received to give account to the lord chancellor, *&c.* They have a ſtanding committee at the chapter-houſe, to prepare matters for the monthly meeting which is held at St. Martin's library.

SOCIETY *for propagating Chriſtian knowledge*. This was begun in 1699, by ſome perſons of worth, *&c.* Its original deſign was to propagate religion in the plantations, to ſecure the pious education of the poor at home, and to reclaim thoſe that err in the fundamentals of Chriſtianity. In the year 1701, they had procured conſiderable charities, and tranſmitted the ſame to the plantations, in libraries, bibles, catechiſms, *&c.* with a voluntary maintenance for ſeveral miniſters to be employed in the plantations; but the ſociety for propagating the goſpel in foreign parts being then inſtituted, they were incorporated by charter in the ſame, and thus diſcharged as a particular ſociety from the further purſuit of that branch of their original deſign; whereupon they wholly turned themſelves to the other, and are now very conſiderable by great acceſſions from the clergy and laity. They meet weekly to concert meaſures for raiſing charity for educating poor children, and ſetting up ſchools for that purpoſe, as alſo for the more regular diſpoſal of books for the inſtruction of the ignorant, erroneous, *&c.*

For the other ſocieties eſtabliſhed by charter, ſee COLLEGE, COMPANY, CORPORATION, and STOCKS.

SOCIETY, in Scots law. See LAW, Tit. xxii. 5.

SOCII CRIMINIS, in Scots law. See LAW, Tit. xxxiii. 50.

SOCINIANS, in church-hiſtory, a ſect of Chriſtian heretics, ſo called from their founder Fauſtus Socinus, a native of Sienna in Italy. He, about the year 1574, began openly to declare againſt the catholic faith, and taught, 1. That the eternal Father was the one only God; that the Word was no more than an expreſſion of the Godhead, and had not exiſted from all eternity; and that Jeſus Chriſt was God no otherwiſe than by his ſuperiority above all creatures who were put in ſubjection to him by the the Father. 2. That Jeſus Chriſt was not a mediator between God and men, but ſent into the world to ſerve as a pattern of their conduct. 3. That the puniſhment of hell will laſt but for a certain time, after which the body and ſoul will be deſtroyed. And, 4. That it is not lawful for princes to make war. Theſe four tenets were what Socinus defended with the greateſt zeal. In other matters, he was a Lutheran or a Calviniſt; and the truth is, that he did but refine upon the errors of all the antitrinitarians that went before him.

SOCOTORA, an iſland in the Indian ocean, about ſeventy miles long, and fifty broad: ſituate in E. long. 53°, N. lat. 11′.

SOCRATIC PHILOSOPHY, the doctrines and opinions, with regard to morality and religion, maintained and taught by Socrates. By the character of Socrates left us by the ancients, particularly by his ſcholar Plato, Laertius, *&c.* he appears to have been one of the beſt and the wiſeſt perſons in all the heathen world. To him is aſcribed the firſt introducing of moral philoſophy, which is what is meant by that uſual ſaying, "That Socrates "firſt called philoſophy down from heaven to earth;" that is, from the contemplation of the heavens and heavenly bodies, he led men to conſider themſelves, their own paſſions, opinions, faculties, duties, actions, *&c.* He wrote nothing himſelf; yet all the Grecian ſects of philoſophers refer their origin to his diſcipline, particularly the platoniſts, peripatetics, academics, cyrenaics, ſtoics, *&c.* but the greateſt part of his philoſophy we have in the works of Plato.

SODA, or HEAT *of the ſtomach*, in medicine, the name of a diſtemper conſiſting in a heat or troubleſome burning about the pit of the ſtomach, or its left mouth, which ſometimes is extended the whole length of the œſophagus, with a preſſure or ſpaſmodic conſtriction, uſually attacking the patient by fits. See MEDICINE.

SODBURY, a market-town of Glouceſterſhire, ſituated ten miles north-eaſt of Briſtol.

SODOMY, the unnatural crime of buggery, thus called from the city of Sodom, which was deſtroyed by fire for the ſame. The Levitical law adjudged thoſe guilty of this execrable crime to death, and the civil law aſſigns the ſame puniſhment to it. Our law alſo makes it felony.

There is no ſtatute in Scotland againſt ſodomy; the libel

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libel of the crime is therefore founded on the divine law, and practice makes its puniſhment to be burning alive.

SOFA, in the Turkiſh cuſtoms, a bench of wood raiſed from the ground about a foot high, and placed round a hall or chamber for the people to ſit down upon, or to lie along, and in that poſture to take a view of what paſſes in the ſtreets, *&c.* for theſe benches are ſurrounded with windows; they are covered with fine Tuky carpets; and upon that are placed cuſhions of ſattin, flowered with gold or ſome other rich ſtuff.

SOFALA, the capital of the territory of that name in Africa, ſituated at the mouth of the river Sofala, in E. long. 35°, S. lat. 20°.

SOFFITA, or SOFFIT, in achitecture, any plafond or ceiling formed of croſs beams of flying corniches, the ſquare compartiments or pannels of which are enriched with ſculpture, painting or gilding; ſuch are thoſe in the palaces of Italy, and in the apartments of Luxemburg at Paris.

SOFTENING, in painting, the mixing and diluting of colours with the bruſh or pencil.

SOGDIANA, a country of Aſia, ſituated on the north ſide of the river Oxus, which ſeparated it from the ancient Bactria, now a part of Uſbec Tartary.

SOHAM, a market-town of Cambridgeſhire, ſituated on a lake called Soham Meer, in the iſle of Ely, fourteen miles north-eaſt of Cambridge.

SOIL, in agriculture. See AGRICULTURE, p. 50.

SOISSONS, a city of France, in the province of the iſle of France, ſituated on the river Ayſe, fifty-five miles north-eaſt of Paris.

SOL, the SUN, in aſtronomy, *&c.* See ASTRONOMY, p. 435.

SOL, in chemiſtry, is gold. See CHEMISTRY, p. 78.

SOL, in heraldry, denotes Or, the golden colour in the arms of ſovereign princes.

SOLÆUS, in anatomy. See ANATOMY, p. 209.

SOLANUM, in botany, a genus of the pentandria monogynia claſs. The corolla is rotated; the antheræ are very cloſe together, opening with a double pore at the points; and the berry has two cells. There are 30 ſpecies, two of them natives of Britain, *viz.* the nigrum, or common nightſhade; and the dulcamara, or woody nightſhade.

Common nightſhade is uſed to allay inflammations.

Some years ago, the internal uſe of the ſolanum was much recommended by ſome writers, in cancerous caſes, foul ulcers, and ſcorbutic eruptions: however, later experience has found this ſimple to be not only of little or no efficacy in ſuch caſes, but to be attended with actual danger to the patient.

SOLAR, ſomething belonging to the ſun. See ASTRONOMY. p. 435.

SOLDANELLA, in botany, a genus of the pentandria monogynia claſs. The corolla is bell-ſhaped, and ſplit into many ſegments. There is but one ſpecies, a native of Switzerland.

SOLDER, a metallic or mineral compoſition uſed in ſoldering or joining together other metals.

Solders are made of gold, ſilver, copper, tin, biſmuth, and lead; uſually obſerving, that in the compoſition there be ſome of the metal that is to be ſoldered mixed with ſome higher and finer metals. Goldſmiths uſually make four kinds of ſolder, *viz.* ſolder of eight, where to ſeven parts of ſilver there is one of braſs or copper; ſolder of ſix, where only a ſixth part is copper; ſolder of four, and ſolder of three. It is the mixture of copper in the ſolder that makes raiſed plate come always cheaper than flat. The ſolder uſed by plumbers is made of two pounds of lead to one of block-tin. Its goodneſs is tried by melting it, and pouring the bigneſs of a crown-piece upon a table; for if good, there will ariſe little bright ſhining ſtars therein. The ſolder for copper is made like that of the plumbers, only with copper and tin; for very nice works, inſtead of tin they ſometimes uſe a quantity of ſilver. Solder for tin is made of two thirds of tin and one of lead: but where the work is any thing delicate, as in organ pipes, where the juncture is ſcarce diſcernable, it is made of one part of biſmuth and three parts of pewter.

SOLDERING, among mechanics, the joining and faſtening together two pieces of the ſame metal, or of two different metals, by the fuſion and application of ſome metallic compoſition on the extremities of the metals to be joined. See the laſt article.

To ſolder upon ſilver, braſs, or iron: take ſilver, five penny-weight; braſs, four penny-weight; melt them together for ſoft ſolder, which runs ſooneſt. Take ſilver, five penny-weight; copper, three penny-weight; melt them together for hard ſolder. Beat the ſolder thin, and lay it on the place to be ſoldered, which muſt be firſt fitted and bound together with wire, as occaſion requires; then take borax in powder, and temper it like pap, and lay it upon the ſolder, letting it dry; then cover it with quick coals, and blow, and it will run immediately; take it preſently out of the fire, and it is done. It is to be obſerved, that if any thing is to be ſoldered in two places, which cannot well be done at one time, you muſt firſt ſolder with the harder ſolder, and then with the ſoft; for if it be firſt done with the ſoft, it will unſolder again before the other is ſoldered. Let it be obſerved, that if you would have the ſolder run about the piece that is to be ſoldered, you muſt rub ſuch places over with chalk.

In the ſoldering either of gold, ſilver, copper, and all the metals before-mentioned, there is generally uſed borax in powder, and ſometimes roſin. As to iron, it is ſufficient that it be heated red hot, and the two extremities thus hammered together, by which means they will become incorporated into one another.

SOLDIER, a military man liſted to ſerve a prince or ſtate, in conſideration of a certain daily pay.

SOLE, in the manege, a nail or ſort of horn under a horſe's foot, which is much more tender than the other horn that incompaſſes the foot, and by reaſon of its hardneſs is properly called the horn or hoof.

SOLEA, in ichthyology. See PLEURONECTES.

SOLEÆ, among the Romans, a kind of ſandals or ſlippers, which covered only the ſole of the feet, and were bound on with thongs of leather, inſtead of which the women and the effeminate ones of the other ſex tied them on with purple-coloured ribbons, or ſuch as were variouſly adorned with gold and ſilver.

SOLECISM, in grammar, a falſe manner of ſpeaking contrary to the uſe of language and the rules of grammar, either in reſpect of declenſion, conjugation, or ſyntax.

SOLEMNITIES OF DEEDS, in Scots law. See WRITINGS.

SOLEN, in zoology, a genus of inſects belonging to the order

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order of vermes teſtacea. The ſhell is oblong, bivalved, and opening at both ſides; the cardo has a ſubulated reflected tooth, not inſerted into the oppoſite valve. There are eleven ſpecies, diſtinguiſhed by peculiarities in their ſhells.

SOLFAING, in muſick, the naming or pronouncing the ſeveral notes of a ſong by the ſyllables *ut, re, mi, fa, ſol*, &c. and in learning to ſing it. See MUSICK.

SOLICITOR, a perſon employed to take care of, and manage ſuits depending in the courts of law or equity.

There is alſo a great officer of the law, next to the attorney-general, who is ſtyled the king's ſolicitor-general; who holds his office by patent, during the king's pleaſure has the care and concern of managing the king's affairs, and has fees for pleading, beſides other fees ariſing by patents, *&c.* He hath his attendance on the privy-council; and the attorney-general and he were anciently reckoned among the officers of the exchequer; they have their audience, and come within the bar in all other courts.

SOLID, a body whoſe parts are ſo firmly connected together, as not to give way, or ſlip from each other upon the ſmalleſt impreſſion, in which ſenſe, ſolid ſtands oppoſed to fluid.

SOLIDAGO, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is naked; the pappus is ſimple; the calix is imbricated with ſhut ſcales. There are twelve ſpecies, two of them natives of Britain. *viz.* the virgaurea, or common golden rod; and the cambrica, or Welch golden rod.

SOLIDITY, that property of matter, or body, by which it excludes all other bodies from that place which itſelf poſſeſſes. See METAPHYSICS.

SOLILOQUY, a reaſoning or diſcourſe which a man holds with himſelf; or, more properly, according to Papias, it is a diſcourſe by way of anſwer to a queſtion that a man propoſes to himſelf.

Soliloquies are become very common things on the modern ſtage; yet can nothing be more unnatural, than an actor's making long ſpeeches to himſelf, to convey his intentions to the audience. Where ſuch diſcoveries are neceſſary to be made, the poet ſhould rather take care to give the dramatic perſons ſuch confidents as may neceſſarily ſhare their inmoſt thoughts, by which means they will be more naturally conveyed to the audience: yet is even this a ſhift an accurate poet would not be found to have occaſion for.

SOLITARY, ſomething retired or in private, remote from the company or commerce of others of the ſame ſpecies.

SOLITARIES, a denomination of nuns of St. Peter of Alcantara, inſtituted in 1576, the deſign of which is to imitate the ſevere penitent life of that ſaint: thus they are to keep a continual ſilence, never to open their mouths to any body but themſelves; employ their time wholly in ſpiritual exerciſes, and leave the temporal concerns to a number of maids, who have a particular ſuperior in a ſeparate part of the monaſtery. They always go bare footed, without ſandals, gird themſelves with a thick cord, and wear no linen.

SOLMS, the capital of the county of Solms, in the landgraviate of Heſſe-Caſſel, in Germany, thirty-five miles north of Frankfort.

SOLO, in muſick, a term uſed in pieces conſiſting of ſeveral parts, to mark thoſe that are to perform alone.

SOLOMON'S ISLANDS, a cluſter of iſlands in the Pacific ocean, ſituated between 130° and 140° W. long. and between 7° and 12° S. lat.

SOLOMON'S SEAL, in botany. See CONVALLARIA.

SOLOTHURN, one of the cantons of Switzerland, lying between thoſe of Baſil and Bern, the former on the north, and the latter on the ſouth.

The city of Solothurn, capital of the ſaid canton, is ſituated in E. long. 7° 15′, and N. lat. 47° 18′.

SOLSTICE, in aſtronomy, that time when the ſun is in one of the ſolſtitial points; that is, when he is at his greateſt diſtance from the equator. See ASTRONOMY.

SOLVENT, the ſame with diſſolvent. See DISSOLVENT.

SOLUTION, in chemiſtry, denotes an intimate mixture of ſolid bodies with fluids, ſo as ſeemingly to form one homogene liquor; the diſſolving fluid is termed the diſſolvent or menſtruum. See CHEMISTRY, *paſſim*.

SOMERSETSHIRE, a county of England, ſituated on the Briſtol channel, and bounded by Wiltſhire on the eaſt, by Dorſetſhire on the ſouth, and by Devonſhire on the weſt: it is famous for the cloth manufacture.

SOMERTON, a market-town of Somerſetſhire, twelve miles ſouth of Wales.

SOMME, a river of France, which running from eaſt to weſt through Picardy, by Amiens and Abbeville, falls into the Britiſh channel near St. Vallery.

SOMNAMBULI, in medicine, perſons who walk in their ſleep, otherwiſe called noctambuli.

SON, an appellation given to a male child, conſidered in the relation he bears to his parents.

SONATA, in muſick, a piece, or compoſition, intended to be performed by inſtruments only; in which ſenſe, it ſtands oppoſed to cantata, or a piece deſigned for the voice.

SONCHUS, the SOW-THISTLE, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is naked; the calix is imbricated, and ventricoſe; and the pappus is plumoſe. There are ten ſpecies, three of them natives of Britain, *viz.* the oleraceus, or common ſow-thiſtle; the arvenſis, or tree ſow-thiſtle; and the paluſtris, or marſh ſow-thiſtle.

Sonchus is accounted cooling and attenuant, and accordingly preſcribed in the ſtranguries, as alſo in inflammations of all kinds, to be applied externally in the form of a cataplaſm.

SONG, in poetry, a little compoſition, conſiſting of eaſy and natural verſes, ſet to a tune in order to be ſung.

SONG, in muſick, is applied in general to a ſingle piece of muſick, whether contrived for the voice or an inſtrument.

SONNA, a book of Mahometan traditions, wherein all the orthodox muſſelmen are required to believe.

SONNET, in poetry, a compoſition contained in fourteen verſes, *viz.* two ſtanzas, or meaſures, of four verſes each; and two of three; the eight firſt verſes being all in three rhimes.

SONNITES, among the Mahometans, an appellation given to the orthodox muſſelmen, or true believers; in oppoſition to the ſeveral heretical ſects, particularly the ſchiites, or followers of Ali.

SOOT, a volatile matter, ariſing from wood, and other fuel, along with the ſmoke or rather, it is the ſmoke itſelf, fixed and gathered on the ſides of the chimney. See CHEMISTRY, p. 158. and AGRICULTURE, p. 49.

SOPHI,

SOPHI, a title given to the emperor of Perſia; importing as much as wiſe, ſage, or philoſopher. There is no prince in the world whoſe authority is more abſolute than that of the ſophi of Perſia.

SOPHISM, in logic, *&c.* an argument which carries much of the appearance of truth, and yet leads into error.

SOPHIST, a perſon who uſes ſophiſms, with a view to deceive thoſe he would perſuade or convince.

SOPHISTICATION, the adulterating any thing with what is not good or genuine; a practice too common in the making up medicines for ſale; as alſo among vintners, diſtillers, and others, who are accuſed of ſophiſticating their wines, ſpirits, oils, *&c.* by mixing with them cheaper and coarſer materials: and, in many caſes, the cheat is carried on ſo artfully as to deceive the beſt judges.

SOPHORA, in botany, a genus of the decandria monogynia claſs. The calix has five teeth, and is gibbous above; the corolla is papilionaceous, with the wings of the ſame length as the vexillum; and the capſule is a legumen. There are eight ſpecies, none of them natives of Britain.

SOPORIFIC MEDICINES, are thoſe capable of procuring ſleep, as opiates, *&c.* See OPIATES, *&c.*

SORBONNE, the houſe or college of the faculty of theology, in the univerſity of Paris; ſometimes alſo uſed for the faculty itſelf, becauſe it uſually aſſembles in the houſe of the ſorbonne.

SORBUS, in botany, a genus of the icoſandria trigynia claſs. The calix conſiſts of five leaves, and the corolla of five petals; and the berry contains three ſeeds. There are three ſpecies, two of them natives of Britain, *viz.* the domeſtica, or the true ſervice or ſorb; and the aucuparia, quicken-tree, or mountain-aſh.

SORCERY, the crime of witchcraft or divination by the aſſiſtance of an evil ſpirit. See WITCHCRAFT.

SORET, a province of the Hither India, lying northwards of Guzerat: its chief town is Jaganat.

SOREX, in zoology. See MUS.

SORITES, in logic, a ſpecies of reaſoning, in which a great number of propoſitions are ſo linked together, that the predicate of the one becomes continually the ſubject of the next following, till at laſt a concluſion is formed by bringing together the ſubject of the firſt propoſition and the predicate of the laſt. See LOGIC.

SORNERS, in Scots law. See LAW, Tit. xxxiii. 30.

SORREL, in botany. See RUMEX.

Wood SORREL, in botany. See OXALIS.

SORREL COLOUR, in the menage, is a reddiſh colour, generally thought to be a ſign of a good horſe

SORRENTO, a city and port-town of the kingdom of Naples, eighteen miles ſouth of that city.

SORTILEGE, a ſpecies of divination, performed by means of ſortes or lots.

The ſortes preneſtinæ, famous in antiquity, conſiſted in putting a number of letters, or even whole words, into an urn; and then, after ſhaking them together, they were thrown on the ground, and whatever ſentences could be made out from them conſtituted the anſwer of the oracle.

Another kind of ſortes conſiſted in taking ſome celebrated poet, as Homer or Virgil; and, opening the book, whatever preſented itſelf firſt to the eye made the anſwer; and hence it got the name of ſortes homericæ, and ſortes virgilianæ, *&c.*

The ſuperſtitious among the ancient Chriſtians practiſed a ſimilar kind of divination, by opening the Old and New Teſtament; whence it got the name of ſortes ſanctorum.

SOTERIA, in antiquity, ſacrifices offered to the gods for delivering a perſon from danger; as alſo poetical pieces compoſed for the ſame purpoſe.

SOTOVENTO ISLANDS are ſituated on the coaſt of Terra-Firma; the chief of which are Trinidad, Margaretta, Tortuga, *&c.* They are alſo called the Leſſer Antilles.

SOUBISE, a town of Guienne, in France, ſituated on the river Charente, ſeventeen miles ſouth of Rochelle.

SOUGH, among miners, denotes a paſſage dug under ground, to convey off water from mines.

SOVEREIGN, in matters of government, is applied to the ſupreme magiſtrate, or magiſtrates, of an independent government or ſtate; by reaſon their authority is only bounded by the laws of God, of nature, and the fundamental laws of the ſtate: ſuch are kings, princes, *&c.*

SOUL, a ſpiritual ſubſtance, which animates the bodies of living creatures: it is the principle of life and activity within them.

Various have been the opinions of philoſophers concerning the ſubſtance of the human ſoul. The Carteſians make thinking the eſſence of the ſoul. Others again hold, that man is endowed with three kinds of ſouls, *viz.* the rational, which is purely ſpiritual, and infuſed by the immediate inſpiration of God; the irrational, or ſenſitive, which is common to man and brutes; and laſtly, the vegetative ſoul, or principle of growth and nutrition.

That the ſoul is an immaterial ſubſtance appears from hence, that its primary operations of willing and thinking have not only no connection with the known properties of body, but ſeem plainly inconſiſtent with ſome of its moſt eſſential qualities. For the mind diſcovers no relation between thinking and the motion and arrangement of parts.

As to the immortality of the human ſoul, the arguments to prove it may be reduced to the following heads: 1. The nature of the ſoul itſelf, its deſires, ſenſe of moral good and evil, gradual increaſe in knowledge and perfection, *&c.* 2. The moral attributes of God.

Under the former of theſe heads it is urged, that the ſoul, being an immaterial intelligent ſubſtance, does not depend on the body for its exiſtence; and therefore may, nay, and muſt, exiſt after the diſſolution of the body, unleſs annihilated by the ſame power which gave it a being at firſt. This argument, eſpecially if the infinite capacity of the ſoul, its ſtrong deſire after immortality, its rational activity and advancement towards perfection, be likewiſe conſidered, will appear perfectly concluſive to men of a philoſophical turn; becauſe nature, or rather the God of nature, does nothing in vain.

But arguments drawn from the latter head, *viz.* the moral attributes of the Deity, are not only better adapted to convince men unacquainted with abſtract reaſoning, but equally certain and concluſive with the former: for as the juſtice of God can never ſuffer the wicked to eſcape unpuniſhed, nor the good to remain always unrewarded; therefore, arguments drawn from the manifeſt and conſtant proſperity of the wicked, and the frequent unhappineſs of good men in this life, muſt convince every thinking perſon, that there is a future ſtate wherein all will

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will be ſet right, and God's attributes of wiſdom, juſtice, and goodneſs, fully vindicated. We ſhall only add, that had the virtuous and conſcientious part of mankind no hopes of a future ſtate, they would be of all men moſt miſerable: but as this is abſolutely inconſiſtent with the moral character of the Deity, the certainty of ſuch a ſtate is clear to a demonſtration.

SOUND, a ſimple perception, or idea, communicated to the ſoul, by means of the ear, which is the primary organ of hearing. See ANATOMY, p. 295. and PNEUMATICS, p. 488.

SOUND, in geography, denotes in general any ſtreight, or inlet, of the ſea, between two head-lands. However, the name ſound is given, by way of eminence, to the ſtreight between Sweden and Denmark, joining the German ocean to the Baltic, being about four miles over.

SOUNDING, in navigation, is the trying the depth of the water, and the quality of the bottom, either by an inch or three-quarter rope, with a deep ſea-lead at the end of it. See NAVIGATION.

SOUP, a kind of pottage made of bread and broth, or the juice of fleſh, or ſome other matters, uſually ſerved at the beginning of a meal.

SOURIS, in the manege, is a cartilage in the noſtrils of a horſe, by means of which he ſnorts.

SOUTH, one of the four cardinal points from which the winds blow. See NAVIGATION, and PNEUMATICS.

SOUTHAM, a market town of Warwickſhire, ſituated ſeven miles ſouth eaſt of Warwick.

SOUTHAMPTON, a borough and port town of Hampſhire, ſituated on a bay of the Engliſh channel, twelve miles ſouth weſt of Winchester. It ſends two members to parliament.

SOUTHERN-WOOD, in botany. See ARTEMISIA.

SOUTHMOULTON, a market-town of Devonſhire, ſituated twenty-four miles north weſt of Exeter.

SOUTHPETHERTON, a market town of Somerſetſhire, ſituated twenty-two miles ſouth of Wells.

SOUTHWARK a borough of Surry, and a ſuburb to London with which it has a communication by a magnificent bridge. It is ſituated on the ſouth ſide of the Thames, and ſends two members to parliament.

SOUTHWELL, a market-town of Nottinghamſhire, ſituated eight miles north-eaſt of Nottingham.

SOUTHWOULD, a port-town of Suffolk, ſituated on a bay of the German Sea, forty-two miles eaſt of Bury.

SOUVIGNY, a town of France, in the province of Lyonois, and territory of Bourbonois, ſituated fifty miles ſouth-eaſt of Bourges.

SOW, in zoology. See SUS.

Sow, in the iron-works, the name of the block or lump of metal they work at once in the iron furnace.

SOWING, in agriculture. See AGRICULTURE. p. 59.

SPAW, a town of Germany, in the circle of Weſtphalia, and biſhopric of Liege, ſituated ſeventeen miles ſouth eaſt of Liege, famous for its mineral waters ever ſince the time of the Romans, of which there are ſtill great quantities ſent abroad to all parts of Europe.

Spaw waters are the lighteſt and moſt ſubtile of all the mineral waters. One very remarkable virtue of this water is, that it greatly relieves in all diſorders of the kidneys, ureters, and bladder, whether occaſioned by ſtone, gravel, or ulcerations. It poſſeſſes, beſide, all the virtues of the other mineral waters, and is of the greateſt ſervice in edulcorating ſharp, and dividing viſcuous humours, and removing all diſeaſes ariſing from theſe cauſes, by diſpoſing them to paſs off by proper emunctories.

SPACE is defined by Mr Locke to be a ſimple idea which we attain both by our ſight and touch; the modes whereof are diſtance, capacity, extenſion, duration, &c. See METAPHYSICS.

SPACE, in geometry, denotes the area of any figure, or that which fills the interval or diſtance between the lines that terminate it.

SPAGIRIC ART, a name given by authors to that ſpecies of chemiſtry which works on the metals, and is employed in the ſearch of the philoſopher's ſtone.

SPAHI's; horſemen in the Ottoman army, chiefly raiſed in Aſia. The great ſtrength of the grand ſeignior's army conſiſts in the janizaries who are the foot, and the ſpahi's, who are the horſe

SPAIN, including Portugal, is a large peninſula of Europe, lying between 10° weſt and 3° eaſt longitude, and between 30° and 44° north latitude, being about ſeven hundred miles in length from eaſt to weſt, and about five hundred in breadth from north to ſouth: it is bounded by the bay of Biſcay, on the north; by the Pyrenean mountains, which ſeparate it from France, on the north-eaſt; by the Mediterranean ſea, on the ſouth eaſt; and by the Atlantic-ocean, on the weſt.

New SPAIN. See MEXICO.

SPALATRO, a city and port-town of Dalmatia, ſituated on the gulph of Venice: E. long. 17° 45', N. lat. 43° 16'.

SPALDING, a market-town of Lincolnſhire, ſituated under the meridian of London, thirty miles ſouth-eaſt of Lincoln.

SPAN, a meaſure taken from the ſpace between the thumb's end and the tip of the little finger, when both are ſtretched out. The ſpan is eſtimated at three hand's breadths, or nine inches.

SPANDAW, a town of Germany, in the circle of Upper Saxony, and Marquiſate of Brandenburg, ſituated on the river Havel, eight miles north-weſt of Berlin.

SPANIEL, in zoology. See CANIS.

SPAR, in natural hiſtory, a claſs of foſſils, not inflammable nor ſoluble in water; when pure, it is pellucid and colourleſs, and emulating the appearance of cryſtal, but wanting its diſtinguiſhing characters; compoſed of plane and equable plates, not flexile nor elaſtic, not giving fire with ſteel, readily calcining in a ſmall fire, and fermenting violently with acids, and wholly ſoluble in them.

The ſpars, in general, are found in the fiſſures of ſtones, and about mines. Derbyſhire affords enough of them to ſupply the whole world; and the German mines afford yet larger quantities.

SPARADRAPUM, in pharmacy, &c. a ſort of cere-cloth, called alio tela Gualteri, the form whereof is directed as follows. Take of the diapalma plaiſter, and diachylon with the gums, each one pound; ceruſs, half a pound; root of oris finely powdered, an ounce and a half. Mix theſe together; and whilſt they are in fuſion, dip them in ſoft worn-out linen-rags, ſo that they may be covered with the plaiſter on each ſide; then take them out, ſpread them, and let them dry; and ſmoothe the ſurfaces with

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a knife or ſpatula. The principal uſe of theſe is for iſſues.

SPARGANIUM, in botany, a genus of the monœcia triandria claſs. The amentum of both male and female is roundiſh; and the calix of both conſiſts of three leaves; neither of them have any corolla; the ſtigma of the female is bifid; and the drupa is dry, and contains two ſeeds. There are two ſpecies, both natives of Britain, *viz.* the erectum, or great-bur-reed; and the natans, or leaſt bur reed.

SPARROW, in ornithology. See FRINGILLA.

SPARROW-HAWK, in ornithology. See FALCO.

SPARTIUM, in botany, a genus of the diadelphia decandria claſs. The ſtigma is longitudinal, and downy above; the filaments adhere to the carina; and the calix is longeſt on the back part. There are 10 ſpecies, only one of them, *viz.* the ſcoparcium, or common broom, a native of Britain.

SPARTIVENTO CAPE, the moſt ſouthern point or promontory of Italy: ſituated in E. long. 16° 30′, N. lat. 38° 20′.

SPARUS, in ichthyology, a genus belonging to the order of thoracici. The fore-teeth and dog-teeth are very ſtrong; the grinders are obtuſe, and thick ſet; the lips are folded over; there are five rays in the gill-membrane, and the opercula are ſcaly; the body is compreſſed; the lateral line is crooked behind; and the pectoral fins are roundiſh. There are 26 ſpecies.

SPASM, in medicine, a convulſion.

A ſpaſm, according to Hoffman, may be univerſal or particular, ſalutary or morbous. An univerſal ſpaſm happens if the whole vaſcular genus, chiefly the heart and arteries, as alſo the fibres of the ſyſtem, are affected, and there is a preternatural conſtriction therein, whereby the ſyſtole and diaſtole are increaſed, and the progreſs of the blood accelerated; this conſtitutes a fever, whereof a frequent pulſe is the moſt certain ſign. See MEDICINE.

SPASMODIC, ſomething belonging to a ſpaſm or convulſion. See the laſt article.

SPATHA, in botany. See BOTANY, p. 636.

SPAVIN, in the manege, a diſeaſe in horſes, being a ſwelling or ſtiffneſs, uſually in the ham, occaſioning a lameneſs. See FARRIERY, p. 572.

SPAYING, or SPADING, the operation of caſtrating the females of ſeveral kinds of animals, as ſows, bitches, *&c.* to prevent any further conception, and promote their fattening.

It is performed by cutting them in the mid flank, on the left ſide, with a ſharp knife or lancet, taking out the uterus and cutting it off, and ſo ſtitching up the wound, anointing the part with tar, and keeping the animal warm for two or three days. The uſual way is to make the inciſion aſlope two inches and a half long, that the fore-finger may be put in towards the back to feel for the ovaries, which are two kernels as big as acorns on both ſides of the uterus, one of which is drawn to the wound, the ſtring thereof cut, and thus both taken out.

SPEAKER *of the houſe of commons*, a member of the houſe, elected by a majority of the votes thereof, to act as chairman or preſident in putting queſtions, reading briefs or bills, keeping order, reprimanding the refractory, adjourning the houſe, *&c.* See PARLIAMENT.

SPEAKING, the art or act of expreſſing one's thoughts in articulate ſounds or words.

SPECIAL, ſomething that is particular, or has a particular deſignation; from the Latin *ſpecies*, in oppoſition to general from *genus*.

SPECIES, in logic, a relative term, expreſſing an idea which is compriſed under ſome general one called a genus, See LOGIC and METAPHYSICS.

SPECIES, in optics, the image painted on the retina, by the rays of light reflected from the ſeveral points of the ſurface of an object.

SPECIES, in commerce, are the ſeveral pieces of gold, ſilver, copper, *&c.* which having paſſed their full preparation and coinage are current in public. See MONEY.

SPECIFIC, in philoſophy, that which is peculiar to any thing, and diſtinguiſhes it from all others.

SPECIFIC, in medicine, a remedy whoſe virtue and effect is peculiarly adapted to ſome certain diſeaſe, is adequate thereto, and exerts its whole force immediately thereon.

SPECIFICATION, in Scots law. See LAW, Tit. viii. 7.

SPECTACLES, in dioptrics, a machine conſiſting of two lenſes, ſet in ſilver, horn, *&c.* to aſſiſt the defects of the organ of ſight.

Old people, and others who have flat eyes, uſe convex ſpectacles, which cauſe the rays of light to converge ſo as to fall upon the retina: whereas myopes, or ſhort-ſighted perſons, uſe concave lenſes for ſpectacles, which cauſing the rays to diverge, prevent their meeting ere they reach the retina. See OPTICS.

SPECULARIS LAPIS, in natural hiſtory, a genus of talcs compoſed of large plates viſibly ſeparate, and of extreme thinneſs; and each fiſſile again ſeparated into a number of plates ſtill finer.

Of this genus there are three ſpecies. 1. The white ſhining ſpecularis, with large and broad leaves, commonly called iſing-glaſs and Muſcovy-glaſs: its lamellæ, or leaves, are extremely thin, elaſtic, and tranſparent; it makes not the leaſt effervescence with aqua-fortis, and is not eaſily calcined in the fire. It is imported in great quantities: the miniature painters cover their pictures with it; the lantern-makers ſometimes uſe it inſtead of horn; and minute objects are uſually preſerved between two plates of it, for examination by the microſcope. 2. The bright brown ſpecularis, with broad leaves; a very valuable ſpecies, though inferior to the former. 3. The purple bright ſpecularis, with broad leaves; which is the moſt elegant of all the talcs, and not leſs beautifully tranſparent than the firſt kind.

SPECULATIVE, ſomething relating to the theory of ſome art or ſcience, in contradiſtinction to practical

SPECULUM, A LOOKING-GLASS, or MIRROUR, capable of reflecting the rays of the ſun, *&c.* See OPTICS.

SPECULUM, in ſurgery, an inſtrument for dilating a wound, or the like, in order to examine it attentively. See SURGERY.

SPEECH, in general, the art or act of expreſſing a perſon's thoughts, by means of articulate ſounds, which we call words. See LANGUAGE and GRAMMAR.

SPEEDWELL, in botany. See VERONICA.

SPELL, in general, denotes the ſame with charm or amulet. See CHARM and AMULET.

SPELLING, in grammar, that part of orthography which teaches

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teaches the true manner of reſolving words into their ſyllables. See GRAMMAR.

SPERGULA, in botany, a genus of the decandria pentagynia claſs. The calix conſiſts of five leaves, and the corolla of five entire petals; the capſule is oval, with one cell and five valves. There are five ſpecies, three of them natives of Britain, *viz.* the arvenſis, or corn-ſpurrey; the pentandria, or ſmall ſpurrey; and the nodoſa, or knotted ſpurrey.

SPERM. See SEED.

SPERMA-CETI, a white flaky ſubſtance, prepared from the oil of a ſpecies of whale, called phyſeter macrocephalus. See PHYSETER.

SPERMACOCE, in botany, a genus of the tetrandria monogynia claſs. The corolla conſiſts of one funnel-ſhaped petal; and it has two bidentated ſeeds. There are ſix ſpecies, none of them natives of Britain.

SPERMATIC, in anatomy, ſomething belonging to the ſperm or ſeed. See ANATOMY, p. 270.

SPEY, a river of Scotland, which, running north-eaſt, through Badenoch and Murray, falls into the German ſea, eaſt of the frith of Murray.

SPHACELUS, in ſurgery and medicine, an abſolute and perfect corruption or death of the parts. See MEDICINE and SURGERY

SPHÆRANTHUS, in botany, a genus of the ſyngeneſia polygamia ſegregata claſs. The receptacle is naked; it has no pappus; the calix is imbricated. There are two ſpecies, none of them natives of Britain.

SPHAGNUM, in botany, a genus of the cryptogamia muſcorum claſs. The antheræ are operculated, and there is no calyptra. The ſpecies are three, all natives of Britain, *viz.* the paluſtre, or grey bog-moſs; the alpinum, or mountain bog-moſs; and the arboreum, or creeping bog moſs.

Os SPHENOIDES, in anatomy. See ANATOMY, p. 158.

SPHERE, is a ſolid contained under one uniform round ſurface, ſuch as would be formed by the revolution of a circle about a diameter thereof, as an axis. See GEOMETRY, and ASTRONOMY.

SPHEROID, in geometry, a ſolid, approaching to the figure of a ſphere.

The ſpheroid is generated by the entire revolution of a ſemi-ellipſis about its axis.

SPHINCTER, in anatomy, a term applied to a kind of circular muſcles, or muſcles in form of rings, which ſerve to cloſe and draw up ſeveral orifices of the body, and prevent the excretion of the contents.

SPHINX, in ſculpture, *&c.* a figure or repreſentation of a monſter of that name, famed among the ancients, now moſtly uſed as an ornament in gardens, terraces, *&c.* It is repreſented with the head and breaſts of a woman, the wings of a bird, the claws of a lion, and the reſt of the body like a dog.

SPICA VIRGINIS, a ſtar of the firſt magnitude, in the conſtellation virgo. See ASTRONOMY, p. 487.

SPICE, any kind of aromatic drug that has hot and pungent qualities: ſuch are pepper, nutmeg, ginger, cinnamon, cloves, *&c*

SPICE-ISLANDS, ſituated in the Eaſt Indies. See BANDA, MOLUCCA-ISLANDS, and CEYLON.

SPIDER, in zoology. See ARANEA.

SPIDER-WORT, in botany. See PHALANGIUM.

SPIEL, in the glaſs-trade, an iron inſtrument, hooked at the end, and pointed, with which the workmen take the metal up out of the melting-pots, for proofs or eſſays, to ſee whether it be fit for work.

SPIGELBURG, a town of Germany, in the circle of Weſtphalia, capital of the county of Spigelburg: E. long. 9° 25′, N. lat. 52° 6′.

SPIGELIA, in botany, a genus of the pentandria monogynia claſs. The corolla is funnel-ſhaped; and the capſule has two cells, and containing many ſeeds.

SPIKE, or *oil of* SPIKE, a name given to an eſſential oil diſtilled from lavender, and much uſed by the varniſh-makers and the painters in enamel.

SPIKENARD, in botany. See NARDUS.

Ploughman's SPIKENARD, in botany. See CONYZA.

SPILIMBERGO, a town of Italy, in the territory of Venice, and province of Friuli: ſituated forty-five miles north of Venice.

SPILSBY, a market-town of Lincolnſhire: ſituated twenty-ſeven miles eaſt of Lincoln.

SPINA VENTOSA, in ſurgery, that ſpecies of corruption of the bones which takes its riſe in the internal parts, and by degrees enlarges the bone, and raiſes it into a tumour, See SURGERY.

SPINACHIA, in botany, a genus of the dioecia pentandria claſs. The calix of the male conſiſts of five ſegments, and that of the female of four; neither of them have any corolla; the ſtyli are four; and there is one hard ſeed within the calix. The ſpecies are two, none of them natives of Britain.

SPINAL MARROW. See ANATOMY, p. 288.

SPINALIS, in anatomy, the names of ſeveral muſcles, *&c.* See ANATOMY, p. 195. *&c.*

SPINE, SPINA DORSI, in anatomy. See ANATOMY, p. 166.

SPINET, or SPINNET, a muſical inſtrument, ranked in the ſecond or third place among harmonious inſtruments.

SPINNING, the act or art of reducing ſilk, flax, hemp, wool, hair, or other matters, into thread. Spinning is either performed on the wheel with a diſtaff and ſpindle, or with other machines proper for the ſeveral kinds of working. Hemp, flax, nettle-thread, and the like vegetable matters, are to be wetted in ſpinning; ſilks, wools, *&c.* are to be ſpun dry, and do not need water; but there is a way of ſpinning ſilk as it comes off the caſes or balls, where hot and even boiling water is to be uſed.

SPINOZISM, the doctrine of Spinoza, or atheiſm and pantheiſm propoſed after the manner of Spinoza, who was born a Jew at Amſterdam.

The great principles of Spinoziſm, is, that there is nothing properly and abſolutely exiſting beſides matter and the modifications of matter; among which are even comprehended thought, abſtract and general ideas, compariſons, relations, combinations of relations, *&c.*

The chief articles in Spinoza's ſyſtem are reducible to theſe. That there is but one ſubſtance in nature; and that this only ſubſtance is endued with an infinite number of attributes, among which are extenſion and cogitation: that all the bodies in the univerſe are modifications of this ſubſtance conſidered as it is extended; and that all the ſouls of men are modifications of the ſame ſubſtance conſidered as cogitative: that God is a neceſſary and infinitely perfect Being, and is the cauſe of all things that exiſt,

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exiſt, but not a different being from them: that there is but one being and one nature, and that this nature produces within itſelf, by an immanent act, all thoſe which we call creatures; and that this being is at the ſame time both agent and patient, efficient cauſe and ſubject, but that he produces nothing but modifications of himſelf.

SPIRÆA, in botany, a genus of the icoſandria pentagynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; and the capſule contains many ſeeds. There are eleven ſpecies, none of them natives of Britain.

SPIRAL, in geometry, a curve line of the circular kind, which, in its progreſs, recedes from its center.

SPIRAL, in architecture and ſculpture, implies a curve that aſcends, winding about a cone or ſpire, ſo as all the points thereof continually approach the axis. It is diſtinguiſhed from the helix, by its winding around a cone, whereas the helix winds in the ſame manner around a cylinder.

SPIRE, in architecture, was uſed by the ancients for the baſe of a column, and ſometimes for the aſtragal or tore. But among the moderns, it denotes a ſteeple that continually diminiſhes as it aſcends, whether conically or pyramidally.

SPIRE, in geography, an imperial city of Germany, capital of a biſhopric of the ſame name, and ſituated in the palatinate of the Rhine, fifteen miles ſouth-weſt of Heidelburg: E. long. 8° 17′, N. lat. 49° 16′.

SPIRIT, in metaphyſics, an incorporeal being or intelligence; in which ſenſe, God is ſaid to be a ſpirit, as are angels and the human ſoul.

SPIRITS, or ANIMAL SPIRITS, in phyſiology. See ANATOMY, p. 253, and ÆTHER.

SPIRIT, in chemiſtry, a name applied to ſeveral very different ſubſtances. However, in general, it denotes any diſtilled volatil liquor that is not inſipid, as phlegm, or pure water, not inflammable as oil: but under this general idea are comprehended liquors of quite oppoſite natures, ſome being acid, and others alkaline; which laſt are ſuch enemies to the former, that as ſoon as they are put together, they raiſe a violent effervescence, and grow hot: and to theſe may be added a third ſort, called vinous or inflammable ſpirits; which, though very ſubtile or penetrating, are not manifeſtly either acid or alkaline. See CHEMISTRY, p. 69, 95, 161, *&c.*

SPIRITUAL, in general, ſomething belonging to, or partaking of, the nature of ſpirit. See SPIRIT.

SPIRITUALITIES *of a biſhop*, are the profits he receives as a biſhop, and not as a baron of parliament: ſuch are the duties of his viſitation, preſentation money, what ariſes from the ordination and inſtitution of prieſts, the income of his juriſdiction, *&c.*

SPITHEAD, a road between Portſmouth and the iſle of Wight, where the Royal navy of Great Britain frequently rendezvous

SPITTLE, in phyſiology. See SALIVA.

SPITZBERGEN. See GROENLAND.

SPLACHNUM, in botany, a genus of the cryptogamia muſci claſs. The calix of the male flower is a ſmooth conic calyptra; the antheræ are cylindric; and the receptacle coloured, membranaceous, and very large. There are four ſpecies, only one of them, *viz.* the ampullaceum, or common ſplachnum, a native of Britain.

SPLEEN, in anatomy See ANATOMY, p. 266.

SPLEEN-WORT. See ASPLENIUM.

SPLENETIC, a perſon affected with obſtruction of the ſpleen.

SPLENIUS, in anatomy. See ANATOMY, p. 216.

SPLENT, or SPLINT, among farriers, a callous, inſenſible excreſcence, breeding on the ſhank-bone of horſes. See FARRIERY, p. 573.

SPLICING, in the ſea-language, is the untwiſting the ends of two cables or ropes, and working the ſeveral ſtrands into one another by a fidd, ſo that they become as ſtrong as if they were but one rope.

SPODIUM, in pharmacy, one of the fouleſt recrements of copper.

SPOILS, whatever is taken from the enemy in time of war.

Among the ancient Greeks, the ſpoils were divided in common among the whole army; only the general's ſhare was largeſt: but among the Romans, the ſpoils belonged to the republic.

SPOLETTO, the capital of Umbria, in Italy: it is ſituated fifty miles north-eaſt of Rome.

SPONDEE, in ancient poetry, a foot conſiſting of two long ſyllables; as, *omnes*.

SPONDIAS, in botany, a genus of the decandria pentagynia claſs. The calix has five teeth, and the corolla five petals; and the drupa has five cells. There are two ſpecies, both natives of America.

SPONGIA, in zoology, a genus belonging to the order of vermes zoophyta. The whole texture is a congeries of bibulous cells. There are ſix ſpecies, all found in the bottom of the ſea, and ſubmarine rocks. Sponges are much uſed by ſurgeons, and others, for ſucking up ſuperfluous moiſture; which they eaſily part with by preſſure

SPONSORS, among Chriſtians, are thoſe perſons, who, in the office of baptiſm, anſwer or are ſureties for the perſons baptized.

SPONTANEOUS, a term applied to ſuch motions of the body, and operations of the mind, as we perform of ourſelves, without any conſtraint.

SPOON BILL, in ornithology. See PLATEA.

SPOONING, in the ſea-language, is ſaid of a ſhip, which, being under ſail in a ſtorm at ſea, is unable to bear it, and conſequently forced to put right before the wind.

SPORADES, among ancient aſtronomers, a name given to ſuch ſtars as were not included in any conſtellation.

SPORADIC DISEASES, among phyſicians, are ſuch as ſeize particular perſons at any time or ſeaſon, and in any place; in which ſenſe they are diſtinguiſhed from epidemical and endemic diſeaſes.

SPOTS, in aſtronomy, certain places of the ſun's or moon's diſc, obſerved to be either more bright, or darker, than the reſt; and accordingly, called fæculæ and maculæ. See ASTRONOMY.

SPOUT, or WATER-SPOUT, an extraordinary and dangerous meteor, obſerved at ſea, and ſometimes at land, called by the Latins typho and ſipho. Its firſt appearance is in form of a deep cloud, the upper part of which is white, and the lower black: then from the lower part of this cloud hangs, or rather falls down, what is properly called the ſpout, in form of a conical tube, biggeſt at top; and under this tube, there is always a great boiling,

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boiling and flying up of the water of the ſea, as in a *jet d'eau*. For ſome yards above the ſurface of the ſea, the water ſtands as a column or pillar, from the extremity whereof it ſpreads and goes off, as in a kind of ſmoke. Frequently, the cone deſcends ſo low, as to touch the middle of this column, and continue for ſome time contiguous to it; though ſometimes it only points to it, at ſome diſtance, either in a perpendicular or oblique line. Frequently it is ſcarce diſtinguiſhable whether the cone or the column appear the firſt, both appearing all of a ſudden againſt each other. But ſometimes the water boils up from the ſea to a great height, without any appearance of a ſpout pointing to it, either perpendicularly or obliquely. Indeed, generally, the boiling or flying up of the water has the priority, this always preceding its being formed into a column. Generally, the cone does not appear hollow, till towards the end, when the ſea water is violently thrown up along its middle, as ſmoke up a chimney. Soon after this, the ſpout or canal breaks and diſappears; the boiling up of the water, and even the pillar, continuing to the laſt, and for ſome time afterwards; ſometimes till the ſpout form itſelf again, and appear anew; which it ſometimes does ſeveral times in a quarter of an hour.

M. de la Pyme, from a near obſervation of two or three ſpouts in Yorkſhire, deſcribed in the Philoſophical Tranſactions, gathers, that the water-ſpout is nothing but a gyration of clouds by contrary winds, meeting in a point or centre; and there, where the greateſt condenſation and gravitation is, falling down into a pipe or great tube, ſomewhat like Archimedes's ſpiral ſcrew; and, in its working and whirling motion, abſorbing and raiſing the water, in the ſame manner as the ſpiral ſcrew does; and thus deſtroying ſhips, *&c.*

SPRAT, in ichthyology See CLUPEA.

SPRING, in natural hiſtory, a fountain or ſource of water, riſing out of the ground. See HYDROSTATICS.

SPRING, in mechanics, denotes a thin piece of tempered ſteel, or other elaſtic ſubſtance; which, being wound up, ſerves to put ſeveral machines in motion by its elaſticity, or endeavour to unbend itſelf: ſuch is the ſpring of a clock, watch, and the like

SPRING TIDE. See ASTRONOMY, p. 473, *&c.*

SPUNGE. See SPONGIA.

SPUNGING, in gunnery, the cleaning a gun's inſide with a ſpunge, in order to prevent any ſparks of fire from remaining in her, which would endanger the life of him who ſhould load her again.

SPUN YARN, among ſailors, is a kind of line made from rop yarn, and uſed for ſeizing or faſtening things together.

SPUR, a piece of metal, conſiſting of two branches encompaſſing a horſeman's heel, and a rowel in form of a ſtar, advancing out behind to prick the horſe.

SPURGE, in botany. See EUPHORBIA.

SPURGE LAUREL. See DAPHNE.

SPURKETS, in a ſhip, ſpaces between the upper and lower futtocks, or betwixt the rungs fore and aft.

SPURRY, in botany See SPERGULA.

SPUTUM, among phyſicians, denotes the ſame with the ſaliva or ſpittle. See SALIVA.

SPY, a perſon hired to watch the actions, motions, *&c.* of another; particularly of what paſſes in a camp. When a ſpy is diſcovered, he is hanged immediately.

SQUADRON, in military affairs, denotes a body of horſe whoſe number of men is not fixed; but is uſually from one to two hundred.

SQUADRON *of ſhips*, a diviſion or part of a fleet, commanded by a vice-admiral, or commodore.

SQUALUS, the SHARK KIND, in ichthyology, a genus belonging to the order of amphibia nantes. There are five ſpiracula, one on each ſide of the neck; the body is oblong, and ſomewhat cylindrical; and the mouth is ſituate in the anterior part of the head. There are 15 ſpecies, all inhabitants of the ocean.

SQUAMARIA, in botany. See LATHRÆA.

SQUAMOUS, in anatomy, an appellation given to the ſpurious or falſe ſutures of the ſkull, becauſe compoſed of ſquamæ or ſcales like thoſe of fiſhes See ANATOMY, p 152.

SQUARE, in geometry, a quadrilateral figure, both equilateral and equiangular. See GEOMETRY.

SQUARE ROOT. See ARITHMETICK, p 420.

Hollow SQUARE, in the military art, is a body of foot drawn up with an empty ſpace in the middle for the colours, drums, and baggage: faced and covered by the pikes every way, to keep off horſe.

SQUARE, an inſtrument conſiſting of two rules, or branches, faſtened perpendicularly at one end of their extremes, ſo as to form a right angle: it is of great uſe in the deſcription and menſuration of right angles, and laying down perpendiculars.

SQUATINA. See SQUALUS.

SQUILL, in botany. See SCILLA.

SQUINTING. See STRABISMUS.

SQUIRREL, in zoology. See SCIURUS.

STABLE, a place or houſe for horſes, *&c.* furniſhed with ſtalls and proper apartments to contain their food, *&c.*

STACHYS, in botany, a genus of the didynamia gymnoſpermia claſs. The upper labium is vaulted, and the inferior one reflected in the edges; the intermediate labium being largeſt, and emarginated; and the ſtamina are reflected towards the ſides. There are 12 ſpecies, three of them natives of Britain, *viz* the germanica, or baſe hore-hound; the ſilvatica, or hedge nettle; and the paluſtris, or clown's all-heal.

STADIUM, an ancient Greek long meaſure.

Stadium was alſo the courſe or career wherein the Greeks ran their races.

STADTHOLDER, the principal governor or magiſtrate of the United Provinces.

The ſtadtholder ſeems to be impowered, either directly or by his influence, to change both the deputies, magiſtrates, and officers, in every province and city. He is preſident in the ſtates of every province, though he has not ſo much as a ſeat or vote in the ſtates-general: but as he influences the ſtates of each province to ſend what deputies he pleaſes to the ſtates-general, he has, in effect, the appointing the perſons that conſtitute the ſtates-general, and may be deemed ſovereign of the united provinces. The ſtadtholders had once a very great power. We find one of their ſtadtholder's appointing what towns ſhould ſend deputies or members to the aſſembly of the ſtates of Holland: but the ſtadtholderſhip was never hereditary till now, when in the year 1747 it was made ſo in the family of Orange.

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It is obſerved, that the ſtates paſſed by the ſtadtholder's eldeſt ſon, and appointed his younger ſon prince Maurice of Orange their ſtadtholder; and at other times they have ſuppreſſed the ſtadtholderſhip entirely. The ſtadtholder always in the council of ſtate, when the votes happen to be equal, has a deciſive voice.

STAEHELINA, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is naked; the pappus is feathered; and the calix is imbricated with ſcales, membranaceous, coloured, and reflected at the points. There are two ſpecies, none of them natives of Britain.

STAFF, an inſtrument ordinarily uſed to reſt on in walking. The ſtaff is alſo frequently uſed as a kind of natural weapon both of offence and defence, and for ſeveral other purpoſes.

STAFF, in muſick, five lines on which with the intermediate ſpaces the notes of a ſong or piece of muſick are marked.

STAFFORD, the county-town of Staffordſhire, is ſituated one hundred and thirty miles north-weſt of London. It ſends two members to parliament.

STAG, in zoology. See CERVUS.

STAGE, in the modern drama, the place of action and repreſentation, included between the pit and the ſcenes, and anſwering to the proſcenium or pulpitum of the ancients.

STAGGERS. See FARRIERY, p. 552.

STAINES, a town of Middleſex, ſituated nineteen meaſured miles weſt of London.

STAIR-CASE in architecture, an aſcent incloſed between walls, or a balluſtrade, conſiſting of ſtairs, or ſteps, with landing-places and rails, ſerving to make a communication between the ſeveral ſtories of a houſe. See ARCHITECTURE, p 360.

STALACTITÆ, in natural hiſtory, cryſtalline ſpars formed into oblong, conical, round, or irregular bodies, compoſed of various cruſts, and uſually found hanging in form of icicles from the roofs of grottos, &c.

STALBRIDGE, a market-town of Dorſetſhire, ſituated eighteen miles north of Dorcheſter.

STALK, in botany, that part of a plant which riſes immediately from the root, and which ſupports the leaves of the flowers and the fruit.

STALLION, or STONE-HORSE, in the menage, an ungelt horſe, deſigned for the covering of mares, in order to propagate the ſpecies. See EQUUS.

STAMFORD, a borough-town of Lincolnſhire, ſituated thirty-five miles ſouth of Lincoln. It ſends two members to parliament

STAMINA. See BOTANY, p. 625.

STAMINA, in the animal body, are defined to be theſe ſimple original parts, which exiſted firſt in the embryo, or even in the ſeed; and by whoſe diſtinction, augmentation, and accretion, by additional juices, the animal body, at its utmoſt bulk, is ſuppoſed to be formed.

STAMINEOUS, in botany, a term for thoſe flowers of plants which have no petals or flower-leaves, but conſiſt only of a number of ſtamina and piſtils placed in a cup.

STAMP-DUTIES, certain impoſitions laid on all parchment and paper, on which deeds, grants, or other inſtruments, or any proceſs in law or equity, are ingroſſed or written. Theſe duties, when firſt granted, were from forty ſhillings for letters-patent, &c. to ſixpence for the uſual deeds; and one penny for declarations, pleadings, &c. They have been, in general, doubled and trebled, by ſubſequent ſtatutes; and the common ſtamp now is the treble ſixpenny. Perſons writing or engroſſing any thing charged with the duty on parchment or paper, before it is ſtamped, or if it be marked with any lower duty than what is required, are liable to forfeit 5 l.; and the deed ſhall not be deemed good in law, till ſuch penalty is paid, and the ſame be ſtamped, &c.

STAMPALIA, an iſland of the Archipelago, about fifty miles in circumference, ſituated in E. long. 26° 30′, and N. lat. 36° 20′.

STANCHION, or STANCHIONS, in a ſhip, thoſe pillars, which being ſet up pillar-wiſe, do ſupport and ſtrengthen the waſte-trees.

STAND, in commerce, a weight, from two hundred and a half to three hundred, of pitch.

STANDARD, in war, a ſort of banner, or flag, borne as a ſignal for the joining together of the ſeveral troops belonging to the ſame body. See FLAG, &c.

STANDARD, in commerce, the original of a weight, meaſure, or coin, committed to the keeping of a magiſtrate, or depoſited in ſome public place, to regulate, adjuſt, and try the weights uſed by particular perſons in traffick. See MONEY.

STANDON, a town of Hertfordſhire, ſituated under the meridian of London, and ſeven miles north of Hertford.

STANHOPE, a market-town of Durham, ſituated ſixteen miles weſt of Durham.

STANLEY, a town of Glocesterſhire, ſituated twelve miles ſouth of Glocester.

STANNARIES, the mines and works where tin is dug and purified, as in Cornwal, Devonſhire, &c. There are four courts of the ſtannaries in Devonſhire, and as many in Cornwal; and great liberties were granted them by ſeveral acts of parliament in the time of Edward I. &c. though ſomewhat abridged under Edward III. and Charles I.

STANNUM, TIN See CHEMISTRY, p. 83, 135.

STANTON, a town of Lincolnſhire, ſituated ſeventeen miles eaſt of Lincoln, under the meridian of London.

STANZA, in poetry, a certain ſtated number of verſes, generally containing a perfect ſenſe, that ought to end with ſome lively and ingenious thought, or juſt and pertinent reflection.

STAPELIA, in botany, a genus of the pentandria digynia claſs of plants. The plant is contorted, with a double ſtar-like nectarium covering the fructification. There are two ſpecies, both natives of the Cape of Good Hope.

STAPES, in anatomy See ANATOMY, p. 296.

STAPHYLÆA, in botany, a genus of the pentandria trigynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; the capſules are inflected and connate; and there are two globular ſeeds. There are two ſpecies, both natives of the Cape of Good Hope.

STAPHYLINUS, in zoology, a genus of inſects belonging to the order of coleoptera: the antennæ are ſlender; the elytra are dimidiated, and cover the wings; and the tail is ſimple, and furniſhed with two oblong bladders. There are 17 ſpecies, principally diſtinguiſhed by their colour.

STAPLE primarily ſignifies a public place or market, whither,

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ther merchants, *&c.* are obliged to bring their goods to be bought by the people, as the Greve, or the places along the Seine, for ſale of wines and corn, at Paris, whether the merchants of other parts are obliged to bring thoſe commodities.

Formerly the merchants of England were obliged to carry their wool, cloth, lead and other like ſtaple-commodities of this realm, in order to utter the ſame by wholeſale; and theſe ſtaples were appointed to be conſtantly kept at York, Lincoln, Newcaſtle upon Tyne, Norwich, Weſtminſter, Canterbury, Chicheſter, Winchester, Exeter, and Briſtol; in each whereof a public mart was appointed to be kept, and each of them had a court of the mayor of the ſtaple, for deciding differences, held according to the law-merchant, in a ſummary way.

STAR, in aſtronomy. See ASTRONOMY, *paſſim*.

Falling STARS, in meteorology, fiery meteors, which dart through the ſky, in form of a ſtar; being occaſioned by a nitro-ſulphureous matter, the common cauſe of all ſuch meteors.

STAR, in heraldry, a charge frequently borne on the ſhield, and the honourable ordinaries, in figure of a ſtar; which differs only from the mullet, in not being pierced as this laſt is. See MULLET.

STAR, is alſo a badge of honour, worn by the knights of the garter, bath, and thiſtle. See GARTER.

STAR *of Bethlehem*, in botany. See ORNITHOGALUM.

STAR-BOARD, in the ſea-language denotes the right-hand ſide of a ſhip: thus they ſay, ſtar-board the helm, or helm a ſtar board, when he that conds would have the men at the helm or ſteering-wheel, put the helm to the right-ſide of the ſhip.

STAR CHAMBER, a chamber at Weſtminſter, ſo called from having its roof painted with gilt ſtars, wherein the chancellor, aſſiſted by others appointed for that purpoſe, formerly had authority to puniſh routs, riots, and other miſdemeanors that were not by the common law provided againſt.

STAR-FISH. See ASTERIAS.

STAR SHOT, a gelatinous ſubſtance frequently found in fields, and ſuppoſed by the vulgar to have been produced from the meteor called a falling ſtar; but, in reality, is the half-digeſted food of herons, ſea-mews, and the like birds; for theſe birds, when ſhot, have been found, when dying, to diſgorge a ſubſtance of the ſame kind.

STAR-STONE, in natural hiſtory, a name given to certain extraneous foſſile ſtones, in form of ſhort, and commonly ſomewhat crooked columns, compoſed of ſeveral joints; each reſembling the figure of a radiated ſtar, with a greater or ſmaller number of rays in the different ſpecies: they are uſually found of about an inch in length, and of the thickneſs of a gooſe-quill. Some of them have five angles, or rays, and others only four, and in ſome the angles are equi-diſtant, while in others they are irregularly ſo; in ſome alſo they are ſhort and blunt, while in others they are long, narrow, and pointed; and ſome have their angles ſo very ſhort and obtuſe, that at firſt ſight they might be taken for entrochoaſteriæ. The ſeveral joints in the ſame ſpecimen are uſually all of the ſame thickneſs; this however is not always the caſe, but in ſome they are larger at one end, and in others at the middle, than in any other part of the body; and ſome ſpecies have one of the rays biſid; ſo as to emulate the appearance of a ſix-rayed kind.

STAR-THISTLE. See CENTAUREA.

STAR-WORT. See ASTER.

STARCH, a fecula, or ſediment, found at the bottom of veſſels wherein wheat has been ſteeped in water; of which fecula, after ſeparating the bran from it, by paſſing it through ſieves, they form a kind of loaves, which being dried in the ſun or an oven is afterwards cut into little pieces, and ſo ſold. The beſt ſtarch is white, ſoft, and friable, and eaſily broken into powder. Such as require fine ſtarch do not content themſelves, like the ſtarch-men, with refuſe wheat, but uſe the fineſt grain. The proceſs is as follows: The grain being well cleaned is put to ferment in veſſels full of water, which they expoſe to the ſun while in its greateſt heat, changing the water twice a-day, for the ſpace of eight or twelve days, according to the ſeaſon. When the grain burſts eaſily under the finger, they judge it ſufficiently fermented. The fermentation perfected, and the grain thus ſoftened, it is put, handful by handful, into a canvas bag, to ſeparate the flour from the huſks, which is done by rubbing and beating it on a plank laid acroſs the mouth of an empty veſſel that is to receive the flour.

As the veſſels are filled with this liquid flour, there is ſeen ſwimming at the top reddiſh water, which is to be carefully ſcummed off from time to time, and clean water is to be put in its place; which, after ſtirring the whole together, is alſo to be ſtrained through a cloth or ſieve, and what is left behind put into the veſſel with new water, and expoſed to the ſun for ſome time. As the ſediment thickens at the bottom, they drain off the water four or five times, by inclining the veſſel, but without paſſing it through the ſieve. What remains at bottom is the ſtarch, which they cut in pieces to get out, and leave it to dry in the ſun. When dry, it is laid up for uſe.

STARGARD, a town of Germany, in the circle of Upper-Saxony, and duchy of Pomerania, ſituated twenty miles eaſt of Stetin.

STARIA, a city of Ruſſia, in the province of Great Novogorod, ſituated at the ſouth end of the Ilmen-lake: E. long 34° 2′, N. lat. 58°.

STARLING See STURNUS.

START POINT, a cape or promontory of Devonſhire, in the Engliſh channel, twelve miles ſouth of Dartmouth.

STATE, or ESTATE, an empire, kingdom, province, or extent of country under the ſame government.

STATEN ISLAND, an iſland of the province of New York, in North America, ſituated near the mouth of Hudſon's river: in W. long. 72° 31′, N. lat. 41°.

STATERA ROMANA, or STEEL-YARD, a name given to the Roman balance.

STATES, or ESTATES, a term applied to ſeveral orders or claſſes of people aſſembled to conſult of matters for the public good

Thus ſtates-general is the name of an aſſembly conſiſting of the deputies of the ſeven United Provinces: theſe are uſually thirty in number, ſome provinces ſending two, others more; and whatever reſolution the ſtates-general take, muſt be confirmed by every province, and by every city and republic in that province, before it has the force of a law. The deputies of each province, of what number ſoever they be, have only one voice, and are eſteemed

as:

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as but one perſon, the votes being given by provinces. Each province preſides in the aſſembly in its turn, according to the order ſettled among them. Guelderland preſides firſt, then Holland, *&c.*

States of Holland are the deputies of eighteen cities, and one repreſentative of the nobility, conſtituting the ſtates of the province of Holland: the other provinces have likewiſe their ſtates, repreſenting their ſovereignty, deputies from which make what they call the ſtates-general. In an aſſembly of the ſtates of a particular province, one diſſenting voice prevents their coming to any reſolution.

STATICE, in botany, a genus of the pentandria trigynia claſs. The calix is one entire plaited leaf; the corolla conſiſts of five petals; it has but one ſeed. There are 14 ſpecies, three of them natives of Britain, *viz.* the armeria, or ſea gilly-flower; the limonium, or ſea-lavender; and the reticulata, or matted ſea-lavender.

STATICS, that branch of mathematics which conſiders the motion of bodies ariſing from gravity. See HYDROSTATICS, and MECHANICS.

STATION, in geometry, ſurveying, *&c.* a place pitched upon to make an obſervation, take an angle, or the like.

STATIONARY, in aſtronomy, ſignifies the appearance of a planet, when it ſeems to remain immoveable on the ſame point of the zodiac for ſeveral days. See ASTRONOMY.

STATIONARY-DAYS, in church-hiſtory, an appellation given to the weekly faſt-days, *viz.* Wedneſdays, and Fridays; otherwiſe called half-faſts, and faſts of the fourth and ſixth days of the week.

Theſe faſts are certainly as ancient as Clemens Alexandrinus and Tertullian, who both mention them; and the reaſon of their inſtitution is, becauſe on the fourth day of the week the Jews took council to put our Saviour to death, which was actually accompliſhed on the ſixth: however, being in continual uſe throughout the year, they were not kept with ſuch rigour and ſtrictneſs as Lent. See the article LENT.

STATIVA, among the Romans, a ſtanding camp kept for the defence of the frontiers of the empire. Theſe camps gave riſe to a great many towns, which took their names from the legion ſtationed there.

STATUARY, a branch of ſculpture, employed in the making of ſtatues. See SCULPTURE, and the next article.

Statuary is one of thoſe arts wherein the ancients ſurpaſſed the moderns; and indeed it was much more popular, and more cultivated, among the former than the latter.

STATUE, is defined to be a piece of ſculpture in full relievo, repreſenting a human figure.

Statues are formed with the chiſſel of ſeveral matters, as ſtone, marble, plaſter, *&c.* They are alſo caſt of various kinds of metals, particularly gold, ſilver, braſs, and lead.

Every ſtatue, reſembling the perſon it is intended to repreſent, is called *ſtatua iconica*. Statues acquire various other denominations. 1. Thus allegorical ſtatue, is that which, under a human figure, or other ſymbol, repreſents ſomething of another kind, as a part of the earth, a ſeaſon, age, element, temperament, hour, *&c.* 2. Curule ſtatues, are thoſe which are repreſented in chariots drawn by bigæ, or quadrigæ, that is, by two or four horſes; of which kind there were ſeveral in the circuſes, hippodromes, *&c.* or in cars, as we ſee ſome, with triumphal arches, on antique medals. 3. Equeſtrian ſtatue, that which repreſents ſome illuſtrious perſon on horſe-back, as that famous one of Marcus Aurelius, at Rome; that of king Charles I. at Charing-croſs, king George II. in Leiceſter-ſquare, London; king Charles II. in the Parliament-cloſe, Edinburgh; king William III. at the croſs, Glaſgow; *&c.* 4. Greek ſtatue, denotes a figure that is naked and antique; it being in the manner the Greeks repreſented their deities, athletæ of the olympic games, and heroes: ſtatues of the heroes were particularly called Achillean ſtatues, by reaſon of the great number of figures of that prince in moſt of the cities of Greece. 5. Hydraulic ſtatue, is any figure placed as an ornament of a fountain or grotto, or that does the office of a jet d'eau, a cock, ſpout, or the like, by any of its parts; the like is to be underſtood of any animal ſerving for the ſame uſe. 6. Pedeſtrian ſtatue, a ſtatue ſtanding on foot; as that of king George II. in the royal infirmary, Edinburgh; that of king Charles II. in the royal-exchange, London; and of king James II. in the privy-Gardens. 7. Roman ſtatue, is an appellation given to ſuch as are cloathed, and which receive various names from their various dreſſes. Thoſe of emperors, with long gowns over their armour, were called *ſtatuæ paludatæ:* thoſe of captains and cavaliers, with coats of arms, *thoracatæ:* thoſe of ſoldiers, with cuiraſſes, *loricatæ:* thoſe of ſenators and augurs, *trabeatæ:* thoſe of magiſtrates, with long robes, *togatæ:* thoſe of the people, with a plain tunica, *tunicatæ:* and laſtly, thoſe of the women, with long trains, *ſtolatæ*. The Romans had another diviſion of ſtatues into divine, which were thoſe conſecrated to the gods, as Jupiter, Mars, Apollo, *&c.*; Heroes, which were thoſe of the demi-gods, as Hercules, *&c.*; and Auguſti, which were thoſe of the emperors, as thoſe two of Cæſar and Auguſtus under the portico of the capitol. In repairing a ſtatue caſt in a mould they touch it up with a chiſſel, graver, or other inſtrument, to finiſh the places which have not come well off: they alſo clear off the barb, and what is redundant in the joints and projectures.

STATURE, the ſize or height of a man.

STATUTE, in its general ſenſe, ſignifies a law, ordinance, decree, *&c.* See LAW, *&c.*

Statute, in our laws and cuſtoms, more immediately ſignifies an act of parliament made by the three eſtates of the realm: and ſuch ſtatutes are either general, of which the courts at Weſtminſter muſt take notice, without pleading them; or they are ſpecial and private, which fact muſt be pleaded.

STAVANGER, a port-town of Norway, in the province of Bergen, capital of the territory Stavenger, ſituated on a peninſula in the German ocean: E. long. 6° 30′, N. lat. 59° 30′.

STAVEREN, a port-town of the United-Netherlands, in the province of Weſt Frieſland, ſituated on the Zuyderſea: E. long. 5° 12′, N. lat 53°.

STAY, in the ſea-language, a big ſtrong rope faſtened to the top of one maſt, and to the foot of that next before it towards the prow, ſerving to keep it firm, and prevent its falling aftwards or towards the poop.

STEADY, a word of command at ſea, for the man at the helm to keep the ſhip ſteady in her courſe, and not to make angles (or yaws, as they call them) in and out.

STEATITES, in the hiſtory of foſſils, a name given by late

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late authors, to a ſubſtance called, in Engliſh, ſoap-earth. Dr Woodward much recommends it as a ſubſtance for making porcelain; and repeated trials of it have been made ſince his time, and ſome of them very lately; in all which it has afforded the fineſt earthen-ware ever made with us, and promiſes fair, with good management, for the equalling any in the world. It is dug in many parts of Devonſhire and Cornwall, and the neighbouring counties; the cliff of the Lizard-point is almoſt wholly compoſed of it, and the adjacent little iſlands abound with it; and from all theſe places it might be brought, at a ſmall expence, in any quantities. It is known from all other earths by theſe characters: it is compoſed of extremely fine particles; and is of a firm, equal and regular texture, and a great weight. It is very firm and hard as it lies in the earth, but when it has been ſome time expoſed to the air, it becomes almoſt of a ſtony hardneſs. It is of a perfectly fine, ſmooth, and gloſſy ſurface, ſofter to the touch than any other ſpecies of earth, and does not at all adhere to the tongue, or ſtain the fingers in handling; but drawn along a rough ſurface, as a piece of cloth, or the like, it marks it with a fine and even white line. In colour it is a clear white, veined and variegated very beautifully with purple of different degrees of deepneſs; and is of ſo fine a ſtructure of parts, that when cut into thin pieces, it is in ſome degree tranſparent. It makes no effervescence with acids; and burns to a pure white, even in its purple parts.

STEATOMA, a kind of encyſted tumour, conſiſting of a matter like ſuet or lard, ſoft, without pain, and without diſcolouring the ſkin.

STEEL, a kind of iron refined and purified by the fire with other ingredients. See CHEMISTRY, p. 134.

STEEL GLASSES, a name given by ſome authors to the metalline ſpheres uſed in optics. Theſe, according to Cardan, are made of three parts of braſs, one part of tin, and one of ſilver, with an eighteenth part of antimony; but moſt either totally leave out the ſilver, or add only a twenty-fourth part, to ſave the expence. There are many other methods, directed by ſeveral authors; but moſt uſe arſenic and tartar mixed with the metals. Theſe are afterwards to be poliſhed with emery, rotten-ſtone, putty, and the like.

STEEL-YARD. See MECHANICS.

STEEPLE, an appendage erected generally on the weſtern end of a church, to hold the bells. Steeples are denominated from their form, either ſpires or towers: the firſt are ſuch as aſcend continually diminiſhing either conically or pyramidically; the latter are mere parallelopipeds, and are covered a-top platform-like.

STEERAGE, on board a ſhip, that part of the ſhip next below the quarter-deck, before the bulk-head of the great cabbin, where the ſteerſman ſtands in moſt ſhips of war. See the next article.

STEERING, in navigation, the directing a veſſel from one place to another by means of the helm and rudder. He is held the beſt ſteerſman who cauſes the leaſt motion in putting the helm over to and again, and who beſt keeps the ſhip from making yaws, that is, from running in and out. See NAVIGATION.

STEEVE, on board a ſhip. The ſeamen ſay the bowſprit or the beak-head of a ſhip ſteeves, when it ſtands too upright, or not ſtraight enough foreward.

STEGANIUM. See SLATE.

STEGANOGRAPHY, the art of ſecret writing, or of writing in cyphers known only to the perſons correſponding.

STEGEBURG, a port-town of Sweden, in the province of Eaſt Gothland, ſituated on a bay of the Baltic: E. long. 16°. N. lat. 58° 30′.

STEGNOTICS, in medicine, remedies proper to cloſe and ſtop the orifices of the veſſels or emunctories when relaxed, ſtretched, lacerated, &c. ſuch as pomegranate-leaves and roſes, plaintain-leaves, tormentil-roots, &c.

STELLATE, among botaniſts, expreſſes leaves which grow not leſs than ſix at a joint, and are arranged like the rays of a ſtar.

STELLERA, in botany, a genus of the octandria monogynia claſs. It has no calix, the corolla conſiſts of four ſegments; the ſtamina are very ſhort; and there is but one roſtrated ſeed. There are two ſpecies, none of them natives of Britain.

STELLIONATE, in Scots law. See LAW, Tit. xxxiii. 36.

STEM, in botany, that part of a plant ariſing out of the root, and which ſuſtains the leaves, flowers, fruits, &c.

STEM *of a ſhip*, that main piece of timber which comes bending from the keel below, where it is ſcarfed, as they call it; that is, pieced in; and riſes compaſſing right before the forecaſtle. This ſtem it is which guides the rake of the ſhip, and all the butt-ends of the planks are fixed into it. This, in the ſection of a firſt-rate ſhip, is called the main ſtem.

STEMPLES, in mining, croſs-bars of wood in the ſhafts which are ſunk to mines. In many places the way is to ſink a perpendicular hole or ſhaft, the ſides of which they ſtrengthen from top to bottom with wood-work, to prevent the earth from falling in: the tranſverſe pieces of wood uſed for this purpoſe, they call ſtemples; and by means of theſe the miners, in ſome places, deſcend without uſing any rope, catching hold of theſe with their hands and feet.

STENOGRAPHY, the art of writing ſhort-hand. See SHORT-HAND WRITING.

STENONIAN DUCT, in anatomy. See ANATOMY, p. 307.

STEP *of the maſt and capſtan*, in a ſhip, is that piece of timber whereon the maſts or capſtans do ſtand at bottom.

STEPHEN, or *St.* STEPHEN'S DAY, a feſtival of the Chriſtian church, obſerved on the 26th of December, in memory of the firſt martyr St. Stephen.

STERCULIA, in botany, a genus of the monœcia monodelphia claſs. The calix both of male and female conſiſts of five ſegments; neither of them have any corolla; the male has 15 filaments; the germen reſts upon a column; and there are five capſules containing many ſeeds. There are two ſpecies, both natives of India.

STEREOGRAPHIC PROJECTION, is the projection of the circles of the ſphere on the plane of ſome one great circle, the eye being placed in the pole of that circle.

STEREOGRAPHY, the art of drawing the forms and figures of the ſolids upon a plane.

STEREOMETRY, that part of geometry which teaches how to meaſure ſolid bodies, *i. e.* to find the ſolidity of ſolid content of bodies, as globes, cylinders, cubes, veſſels, ſhips, &c. See GEOMETRY.

STEREOTOMY, the art or act of cutting ſolids, or making

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king ſections thereof, as walls or other members in the profiles of architecture.

STERILITY, the quality of a thing that is barren, in oppoſition to fertility.

Nature has annexed ſterility to all monſtrous productions, that all the creation might not degenerate. Hence the ſterility of mules, *&c*

STERLING, a term frequent in Britiſh commerce. A pound, ſhilling, or penny ſterling, ſignifies as much as a pound, ſhilling, or penny of lawful money of Great Britain, as ſettled by authority See MONEY.

STERN *of a ſhip*, uſually denotes all the hindermoſt part of it, but properly it is only the outmoſt part abaft.

STERNBERG, a town of Germany, in the circle of Upper Saxony and marquiſate of Brandenburg, ſituated twenty-three miles north-eaſt of Frankfort upon the Oder

STERNOHYOIDÆUS, in anatomy. See ANATOMY, p. 222

STERNUM, in anatomy. See ANATOMY, p. 175.

STERNUTATORY, a medicine proper to produce ſneezing. Sternutatives are of two kinds, gentle and violent. Of the firſt kind are betony, ſage, marjoram, tobacco, and the whole faſhionable tribe of ſnuffs. Of the latter kind are euphorbium, white hellebore, pellitory, *&c*.

STETIN, a city and port-town of Germany, in the circle of Upper Saxony, capital of the duchy of Pomerania, ſituated on the weſt ſhore of the river Oder: E. long. 14° 50′, N. lat 53° 30′.

STEVENAGE, a market-town of Hertfordſhire, ſituated thirty miles north of London, and ten north-weſt of Hertford.

STEW, a ſmall kind of fiſh-pond, the peculiar office of which is to maintain fiſh, and keep them in readineſs for the daily uſe of the family, *&c*.

STEWS, were alſo places anciently permitted in England to women of profeſſed incontinency, for the proffer of their bodies to all comers. Theſe were under particular rules and laws of diſcipline, appointed by the lord of the manor.

STEWARD, an officer appointed in another's ſtead or place, and always taken for a principal officer within his juriſdiction. Of theſe there are various kinds. The greateſt officer under the crown is the lord high ſteward of England, an office that was anciently the inheritance of the earls of Leiceſter, till forfeited by Simon de Mountfort to king Henry III. But the power of this officer is ſo very great, that it has not been judged ſafe to truſt it any longer in the hands of a ſubject, excepting only *pro hac vice*, occaſionally; as, to officiate at a coronation, at the arraignment of a nobleman for high-treaſon, or the like. During his office, the ſteward bears a white ſtaff in his hand: and the trial, *&c*. ended, he breaks the ſtaff, and with it his commiſſion expires. There is likewiſe a lord ſteward of the king's houſehold, who is the chief officer of the kings court, has the care of the king's houſe, and authority over all the officers and ſervants of the houſehold, except ſuch as belong to the chapel, chamber, and ſtable.

STEWART, in Scots law. See LAW, Tit. iv. 5.

STEWARTEA, in botany, a genus of the monadelphia polyandria claſs. The calix is ſimple; the ſtigma is quinquefid; the berry has five lobes, and one ſeed. There is but one ſpecies, a native of Virginia.

STEYNING, a borough-town of Suffolk: ſituated forty miles ſouth of London, and thirteen miles weſt of Lewes. It ſends two members to parliament.

STIBIUM, or ANTIMONY. See CHEMISTRY, p. 87, 139.

STICKLEBACK, in ichthyology. See GASTEROSTEUS.

STIGMA, in botany. See BOTANY, p. 637.

STIGMATA, the apertures in different parts of the bodies of inſects, communicating with the tracheæ, or air-veſſels, and ſerving for the office of reſpiration.

STIGMATA, in antiquity, certain marks impreſſed on the left ſhoulders of the ſoldiers when liſted.

STIGMATIZING, among the ancients, was inflicted upon ſlaves, as a puniſhment, but more frequently as a mark to know them by, in which caſe it was done by applying a red-hot iron marked with certain letters to their foreheads, till a fair impreſſion was made, and then pouring ink into their furrows, that the inſcription might be the more conſpicuous.

STILE. See STYLE.

STILES, in carpentry, denote the upright pieces which go from the bottom to the top of any wainſcot, or the like.

STILLATITIOUS OILS, ſuch as are produced by diſtillation, in oppoſition to thoſe got by infuſion, expreſſion, *&c*.

STILL-BOTTOMS, in the diſtillery, a name given by the traders to what remains in the ſtill after the working the waſh into low wines. Theſe bottoms are procured in the greateſt quantity from the malt-waſh, and are of ſo much value to the diſtiller, in the fattening of hogs, *&c* that he often finds them one of the moſt valuable articles of the buſineſs.

STIMULATING, a property in bodies, whereby they vellicate and cauſe vibrations and inflections of the fibres of the nerves, and a greater derivation of nervous fluid into the parts affected. Stimulants produce pain, heat, redneſs, *&c*

STING, an apparatus in the body of certain inſects, in form of a little ſpear, ſerving them as a weapon of offence. See APIS

STINT, in zoology. See ALAUDA.

STIPA, in botany, a genus of the triandria digynia claſs. The calix conſiſts of two valves, containing one flower; the exterior valve of the corolla terminates in an awn; and it is jointed at the baſe. There are ſeven ſpecies, only one of them, *viz*. the pennata, or feather-graſs, a native of Britain

STIPEND, among the Romans, ſignified the ſame with tribute; and hence ſtipendiarii were the ſame with tributarii.

STIPEND, in Scots law. See LAW, Tit v. 10, *&c*.

STIPULATION, in the civil law, the act of ſtipulating, that is, of treating and concluding terms and conditions to be inſerted in a contract. Stipulations were anciently performed at Rome, with abundance of ceremonies; the firſt whereof was, that one party ſhould interrogate, and the other anſwer, to give his conſent, and oblige himſelf. By the ancient Roman law, no body could ſtipulate but for himſelf; but as the tabelliones were public ſervants, they were allowed to ſtipulate for their maſters; and the notaries, ſucceeding the tabelliones, have inherited the ſame privilege.

STIRIA DUCHY, in Germany, is part of the circle of Auſtria.

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Auſtria, bounded by the duchy of Auſtria on the north, by Hungary on the eaſt, and by Carinthia and Carniola on the ſouth-weſt.

STIRLING, a town of Scotland, capital of the county of Stirling: ſituated on the river Forth, thirty miles north weſt of Edinburgh; defended by a caſtle and other works.

STIRRUP, in the manege, a reſt, or ſupport for the horſeman's foot, ſerving to keep him firm in his ſeat, and to enable him to mount.

STIRRUP *of a ſhip*, a piece of timber put upon a ſhip's keel, when ſome of her keel happens to be beaten off, and they cannot come conveniently to put or fit in a new piece; then they patch in a piece of timber, and bind it on with an iron, which goes under the ſhip's keel, and comes up on each ſide of the ſhip, where it is nailed ſtrongly with ſpikes; and this they call a ſtirrup.

STIVES, the ancient Thebes, in the province of Achaia, now Livadia, in European Turkey.

STOCKHERN, a town of Germany, in the circle of Weſtphalia, and biſhopric of Liege: ſituated on the river Maes, twelve miles north of Maeſtricht

STOCK, in gardening, *&c.* the ſtem or trunk of a tree.

STOCKBRIDGE, a borough-town of Hampſhire, ſituated ſeven miles north-weſt of Wincheſter. It ſends two members to parliament

STOCK-BROKER. See BROKER, and the next article.

STOCK JOBBING, the art or myſtery of trafficking in the public ſtocks or funds. See STOCKS.

STOCKHOLM, the capital city of Sweden, ſituated on ſeveral ſmall iſlands in the Meller Lake: E. long. 18°, N. lat. 59° 30′, three hundred miles north-eaſt of Copenhagen, nine hundred north-eaſt of London, and four hundred weſt of Peterſburgh It is neither walled nor fortified, being ſufficiently ſecured by nature, with little rocks and iſlands, which ſurround it, though it has a ſpacious harbour ſufficient for the largeſt fleets. That part of the town which is properly the city, ſtands upon a little iſland that is not more than a mile and a half in circumference, but the ſuburbs on the adjacent iſland are much larger. The inhabitants are computed about thirty thouſand.

STOCKING, that part of the cloathing of the leg and foot which ſcreens them from the cold. *&c.* Anciently, the only ſtockings in uſe were made of cloth, or of milled ſtuffs ſewed together; but ſince the invention of knitting and weaving ſtockings of ſilk, wool, cotton, thread, *&c.* the uſe of cloth ſtockings is quite out of doors.

STOCKPORT, a market-town of Cheſhire, ſituated thirty-four miles north-eaſt of Cheſter.

STOCKTON, a port-town of Durham, ſituated near the mouth of the river Tees, ſixteen miles ſouth of Durham.

STOCKZOW, a town of Bohemia, in the duchy of Sileſia, ſituated on the river Viſtula, thirty-ſeven miles ſouth-eaſt of Troppaw

STOCKS, *or* PUBLIC FUNDS *in England*. As there are few ſubjects of converſation more general than the value of ſtocks, and hardly any thing ſo little underſtood, we ſhall here give account of them in as clear and conciſe a manner as poſſible; preſenting our readers with the rationale of the ſtocks, and a ſhort hiſtory of the ſeveral companies*, deſcribing the nature of their ſeparate funds, the uſes to which they are applied, and the various purpoſes they anſwer, both with reſpect to the government, the companies themſelves, and the community in general.

In order to have a clear idea of the money-tranſactions of the ſeveral companies, it is neceſſary to know ſomething of money in general, and the difference between that and the current ſpecie. See the article MONEY.

Money is the ſtandard of the value of all the neceſſaries and accommodations of life; and paper money is the repreſentative of that ſtandard to ſuch a degree, as to ſupply its place, and to anſwer all the purpoſes of gold and ſilver coin. Nothing is neceſſary to make this repreſentative of money ſupply the place of ſpecie, but the credit of that office or company who delivers it: which credit conſiſts in its always being ready to turn it into ſpecie whenever required. This is exactly the caſe of the bank of England: the notes of this company are of the ſame value as the current coin, as they may be turned into it whenever the poſſeſſor pleaſes. From hence, as notes are a kind of money, the counterfeiting them is puniſhed with death as well as coining.

The method of depoſiting money in the bank, and exchanging it for notes (though they bear no intereſt) is attended with many conveniencies; as they are not only ſafer than money in the hands of the owner himſelf, but as the notes are more portable and capable of a much more eaſy conveyance: ſince a bank note for a very large ſum may be ſent by the poſt, and, to prevent the deſigns of robbers, may, without damage, be cut in two, and ſent at two ſeveral times. Or bills, called bank poſt-bills, may be had by application at the bank, which are particularly calculated to prevent loſſes by robberies, they being made payable to the order of the perſon who takes them out at a certain number of days after ſight; which gives an opportunity to ſtop bills at the bank if they ſhould be loſt, and prevents their being ſo eaſily negotiated by ſtrangers as common bank notes are: and whoever conſiders the hazard, the expence and trouble there would be in ſending large ſums of gold and ſilver to and from diſtant places, muſt alſo conſider this as a very ſingular advantage. Beſide which another benefit attends them; for if they are deſtroyed by time, or other accidents, the bank will, on oath being made of ſuch accident, and ſecurity being given, pay the money to the perſon who was in poſſeſſion of them.

Bank notes differ from all kinds of ſtock in theſe three particulars. 1 They are always of the ſame value 2. They are paid off without being transferred; and, 3. They bear no intereſt: while ſtocks are a ſhare in a company's funds, bought without any condition of having the principal returned. India bonds indeed (by ſome perſons, tho' erroneouſly, denominated ſtock) are to be excepted; they being made payable at ſix months notice, either on the ſide of the company or of the poſſeſſor.

By the word *ſtock* was originally meant a particular ſum of money contributed to the eſtabliſhing a fund to enable a company to carry on a certain trade, by means of which the perſon became a partner in that trade, and received a ſhare of the profit made thereby, in proportion to the money employed.

* Of theſe a general account only was given under the words COMPANY, and BANK, as it would be neceſſary to reſume them in connection with the preſent article, the better to illuſtrate it.

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ployed. But this term has been extended farther, though improperly, to ſignify any ſum of money which has been lent to the government, on condition of receiving a certain intereſt till the money is repaid, and which makes a part of the national debt. As the ſecurity both of the government and of the public companies is eſteemed preferable to that of any private perſon, as the ſtocks are negotiable and may be ſold at any time, and as the intereſt is always punctually paid when due; ſo they are thereby enabled to borrow money on a lower intereſt than what could be obtained from lending it to private perſons, where there muſt be always ſome danger of loſing both principal and intereſt.

But as every capital ſtock or fund of a company is raiſed for a particular purpoſe, and limited by parliament to a certain ſum, it neceſſarily follows, that when that fund is compleated, no ſtock can be bought of the company; though ſhares already purchaſed may be transferred from one perſon to another. This being the caſe, there is frequently a great diſproportion between the original value of the ſhares, and what is given for them when transferred: for if there are more buyers than ſellers, a perſon who is indifferent about ſelling will not part with his ſhare without a conſiderable profit to himſelf; and, on the contrary, if many are diſpoſed to ſell, and few inclined to buy, the value of ſuch ſhares will naturally fall, in proportion to the impatience of thoſe who want to turn their ſtock into ſpecie.

Theſe obſervations may ſerve to give our readers ſome idea of the nature of that unjuſtifiable and diſhoneſt practice called *ſtock jobbing*, the myſtery of which conſiſts in nothing more than this: The perſons concerned in that practice, who are denominated ſtock-jobbers, make contracts to buy or ſell, at a certain diſtant time, a certain quantity of ſome particular ſtock, againſt which time they endeavour, according as their contract is, either to raiſe or lower ſuch ſtock, by raiſing rumours and ſpreading fictitious ſtories in order to induce people either to ſell out in a hurry, and conſequently cheap, if they are to deliver ſtock, or to become unwilling to ſell, and conſequently to make it dearer, if they are to receive ſtock.

The perſons who make theſe contracts are not in general poſſeſſed of any real ſtock; and when the time comes that they are to receive or deliver the quantity they have contracted for, they only pay ſuch a ſum of money as makes the difference between the price the ſtock was at when they made the contract, and the price it happens to be at when the contract is fulfilled; and it is no uncommon thing for perſons not worth 100 l. to make contracts for the buying or ſelling 100,000 l. ſtock. In the language of Exchange Alley, the buyer in this caſe is called the Bull, and the ſeller the Bear.

Beſide theſe, there are another ſet of men, who, though of a higher rank, may properly enough come under the ſame denomination. Theſe are your great monied men, who are dealers in ſtock, and contracters with the government whenever any new money is to be borrowed. Theſe indeed are not fictitious, but real buyers and ſellers of ſtock; but by raiſing falſe hopes, or creating groundleſs fears, by pretending to buy or ſell large quantities of ſtock on a ſudden, by uſing the fore-mentioned ſet of men as their inſtruments, and other like practices, are enabled to raiſe or lower the ſtocks one or two per cent. at pleaſure.

However, the real value of one ſtock above another, on account of its being more profitable to the proprietors, or any thing that will really, or only in imagination, affect the credit of a company, or endanger the government, by which that credit is ſecured, muſt naturally have a conſiderable effect on the ſtocks. Thus, with reſpect to the intereſt of the proprietors, a ſhare in the ſtock of a trading company which produces 5 l. or 6 l. per cent. per ann. muſt be more valuable than an annuity with government ſecurity, that produces no more than 3 l. or 4 l. per cent. per annum; and conſequently ſuch ſtock muſt ſell at a higher price than ſuch an annuity. Though it muſt be obſerved, that a ſhare in the ſtock of a trading company producing 5 l. or 6 l. per cent. per annum, will not fetch ſo much money at market as a government annuity producing the ſame ſum; becauſe the ſecurity of the company is not reckoned equal to that of the government, and the continuance of their paying ſo much per annum is more precarious, as their dividend is, or ought to be, always in proportion to the profits of their trade.

As the ſtocks of the Eaſt India, the bank, and South-Sea companies, are diſtinguiſhed by different denominations, and are of a very different nature, we ſhall give a ſhort hiſtory of each of them, together with an account of the different ſtocks each is poſſeſſed of; beginning with the Eaſt India company, as the firſt eſtabliſhed.

Of the Eaſt India Company.

There is no trading company in Europe, the Dutch Eaſt India company excepted, which can be put in competition with this. Its was firſt eſtabliſhed in the latter end of the reign of queen Elizabeth; and its privileges have been enlarged, or confirmed, by almoſt every monarch ſince. Its ſhares, or ſubſcriptions, were originally only 50 l. ſterling; and its capital only 369,891 l. 5 s. but the directors having a conſiderable dividend to make in 1676, it was agreed to join the profits to the capital, by which the ſhares were doubled, and conſequently each became of 100 l. value, and the capital 739,782 l. 10 s.; to which capital, if 963,639 l. the profits of the company to the year 1685, be added, the whole ſtock will be found to be 1,703,402 l.

However, this company having ſuſtained ſeveral loſſes by the Dutch, and the ſubjects of the great Mogul, was in a declining way at the Revolution, when the war with France reduced it ſo low, that it appearing ſcarcely poſſibly to be ſupported, a new one was erected. The merchants forming the new Eaſt India company received their charter in 1698, having, in conſideration of the grant thereof, lent the government two millions at 8 per cent. per annum; and puſhing their trade with vigour, they ſoon carried on twice the buſineſs that was ever done by the old company. But after the two companies had ſubſiſted a few years in a ſeparate ſtate, means were contrived to unite them; which was effected in 1702, when a new charter was granted them under the title of the United Company of Merchants trading to the Eaſt Indies.

To the two millions advanced by the new company, the united company in the 6th of queen Anne lent the government 1,200,000 l. which made their whole loan amount to 3,200,000 l. A further ſum was alſo lent by the company in 1730, on a renewal of their charter, the intereſt of which is reduced to 3 per cent. and called the India 3 per cent. annuities.

As to India ſtock, it is of a quite different nature; for as that is not money put out to intereſt, but the trading ſtock

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ſtock of the company; and the proprietors of the ſhares, inſtead of receiving a regular annuity, have a dividend of the profits ariſing from the company's trade; which, as it is more valuable, theſe ſhares generally ſell at a price much above the original value.

As to the management of this united company, all perſons without exception, natives and foreigners, men and women, are admitted members of it, and 500 l. in the ſtock of the company gives the owner a vote in the general court, and 2000 l. qualifies him to be choſen a director. The directors are 24 in number, including the chairman, and deputy chairman, who may be re-elected for four years ſucceſſively. The chairman has a ſalary of 200 l. a year, and each of the directors 150 l. The meetings or courts of directors are to be held at leaſt once a-week; but are commonly oftener, being ſummoned as occaſion requires.

Out of the body of directors are choſen ſeveral committees, who have the peculiar inſpection of certain branches of the company's buſineſs; as the committee of correſpondence, a committee of buying, a committee of treaſury, a houſe committee, a committee of warehouſes, a commitee of ſhipping, a committee of accompts, a committee of law-ſuits, and a committee to prevent the growth of private trade, *&c.* who have under them a ſecretary, caſhier, clerks, warehouſe-keepers, *&c.*

Other officers of the company are governors and factors abroad; ſome of whom have guards of ſoldiers, and live in all the ſtate of ſovereign princes.

Of the Bank of England.

The company of the bank was incorporated by parliament, in the 5th and 6th years of king William and queen Mary, by the name of the Governor and Company of the Bank of England, in conſideration of the loan of 1,200,000 l. granted to the government, for which the ſubſcribers received almoſt 8 per cent. By this charter, the company are not to borrow under their common ſeal, unleſs by act of parliament; they are not to trade, or ſuffer any perſon in truſt for them to trade in any goods or merchandize; but they may deal in bills of exchange, in buying or ſelling bullion, and foreign gold and ſilver coin, *&c.*

By an act of parliament paſſed in the 8th and 9th year of king William III. they were impowered to enlarge their capital ſtock to 2,201,171 l. 10 s. It was then alſo enacted, that bank-ſtock ſhould be a perſonal, and not a real eſtate; that no contract either in word or writing, for buying or ſelling bank-ſtock, ſhould be good in law, unleſs regiſtered in the books of the bank within ſeven days, and the ſtock transferred in 14 days; and that it ſhould be felony, without benefit of clergy, to counterfeit the common ſeal of the bank, or any ſealed bank-bill, or any bank-note, or to alter or eraſe ſuch bills or notes.

By another act paſſed in the 7th of queen Anne, the company were impowered to augment their capital to 4,402,343 l. and they then advanced 400.000 l. more to the government, and in 1714 they advanced another loan of 1,500,000 l.

In the third year of the reign of king George I. the intereſt of their capital ſtock was reduced to 5 per cent. when the bank agreed to deliver up as many exchequer-bills as amounted to 2,000,000 l. and to accept an annuity of 100,000 l. and it was declared lawful for the bank to call from their members, in proportion to their intereſts in the capital ſtock, ſuch ſums of money as in a general court ſhould be found neceſſary. If any member ſhould neglect to pay his ſhare of the moneys ſo called for, at the time appointed by notice in the London Gazette, and fixed upon the Royal Exchange, it ſhould be lawful for the bank not only to ſtop the dividend of ſuch member, and to apply it toward payment of the money in queſtion; but alſo to ſtop the transfers of the ſhare of ſuch defaulter, and to charge him with an intereſt of 5 l. per cent. per annum for the money ſo omitted to be paid: and if the principal and intereſt ſhould be three months unpaid, the bank ſhould then have power to ſell ſo much of the ſtock belonging to the defaulter as would ſatisfy the ſame.

After this the bank reduced the intereſt of the 2,000 000 l. lent to the government from 5 to 4 per cent. and purchaſed ſeveral other annuities, which were afterward redeemed by the government, and the national debt due to the bank reduced to 1,600,000 l. But in 1742, the company engaged to ſupply the government with 1,600,000 l. at 3 per cent. which is now called the 3 per cent. annuities, ſo that the government was now indebted to the company 3,200,000 l. the one half carrying 4, and the other 3 per cent.

In the year 1746, the company agreed that the ſum of 986,800 l. due to them in the exchequer-bills unſatisfied, on the duties for licences to ſell ſpirituous liquors by retail, ſhould be cancelled, and in lieu thereof to accept of an annuity of 39 442 l. the intereſt of that ſum at 4 per cent. The company alſo agreed to advance the further ſum of 1,000,000 l. into the exchequer, upon the credit of the duties ariſing by the malt and land tax, at 4 per cent. for exchequer-bills to be iſſued for that purpoſe; in conſideration of which, the company were enabled to augment their capital with 986,800 l. the intereſt of which, as well as that of the other annuities, was reduced to 3 l. 10 s per cent. till the 25th of December 1757, and from that time to carry only 3 per cent.

And in order to enable them to circulate the ſaid exchequer bills, they eſtabliſhed what is now called bank circulation: the nature of which not being well underſtood, we ſhall take the liberty to be a little more particular in its explanation than we have been with regard to the other ſtocks.

The company of the bank are obliged to keep caſh ſufficient to anſwer not only the common, but alſo any extraordinary demand that may be made upon them; and whatever money they have by them, over and above the ſum ſuppoſed neceſſary for theſe purpoſes, they employ in what may be called the trade of the company; that is to ſay, in diſcounting bills of exchange, in buying of gold and ſilver, and in government ſecurities, *&c.* But when the bank entered into the above mentioned contract, as they did not keep unemployed a larger ſum of money than what they deemed neceſſary to anſwer their ordinary and extraordinary demands, they could not conveniently take out of their current caſh ſo large a ſum as a million, with which they were obliged to furniſh the government, without either leſſening that ſum they employed in diſcounting, buying gold and ſilver, *&c.* (which would have been very diſadvantageous to them,) or inventing ſome method that ſhould anſwer all the purpoſes of keeping the million in caſh. The method

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which they chose, and which fully answers their end, was as follows.

They opened a subscription, which they renew annually, for a million of money; wherein the subscribers advance 10 per cent. and enter in o a contract to pay the remainder, or any p rt ther-of, whenever the bank shall call upon them, under the penalty of forfeiting the 10 per cent. so advanced; in consideration of which, the bank pays the subscribers 4 per cent. interest for the money paid in, and $\frac{1}{2}$ per cent. for the whole sum they agree to furnish; and in case a call should be made upon them for the whole, or any part thereof the bank farther agrees to pay them at the rate of 5 per cent. per annum for such sum till they repay it, which they are under an obligation to do at the end of the year. By this means the bank obtains all the purposes of keeping a million of money by them; and though the subscribers if no call is made upon them (which is in general the case,) receive $6\frac{1}{2}$ per cent. for the money they advance, yet the company gains the sum of 23,500 l. per annum by the contract; as will appear by the following account.

The bank receives from the government for the advance of a million	—— £	30,000
The bank pays to the subscribers who advance 100,000 l. and engage to pay (when called for) 900,000 l. more — —		6.500
The clear gain to the bank therefore is		23,500

This is the state of the case, provided the company should make no call on the subscribers; which they will be very unwilling to do, because it would not only lessen their profit, but affect the public credit in general.

Bank-stock may not improperly be called a trading stock, since with this they deal very largely in foreign gold and silver, in discounting bills of exchange, &c. Beside which, they are allowed by the government very considerable sums annually for the management of the annuities paid at their office. All which advantages render a share in their stock very valuable, though it is not equal in value to the East India stock. The company make dividends of the profits half-yearly, of which notice is publicly given; when those who have occasion for their money may readily receive it; but private persons, if they judge convenient, are permitted to continue their funds, and to have their interest added to the principal.

This company is under the direction of a governor, deputy-governor, and 24 directors, who are annually elected by the general court, in the same manner as in the East India company. Thirteen, or more, compose a court of directors for managing the affairs of the company.

The officers of this company are very numerous.

Of the South-Sea Company.

During the long war with France in the reign of queen Anne, the payment of the sailors of the royal navy being neglected, and they receiving tickets instead of money, were frequently obliged by their necessities to sell these tickets to avaritious men at a discount of 40 l. and sometimes 50 l. per cent. By this and other means the debts of the nation unprovided for by parliament, and which amounted to 9,471,321 l. fell into the hands of these usurers. On which, Mr Harley, at that time chancellor of the exchequer, and afterward earl of Oxford, proposed a scheme to allow the proprietors of these debts and deficiencies 6 l. per cent. per annum, and to incorporate them in order to their carrying on a trade to the South-Sea; and they were accordingly incorporated under the title of the Governor and Company of Merchants of Great Britain trading to the South-Seas and other parts of America, and for encouraging the Fishery, &c.

Though this company seemed formed for the sake of commerce, it is certain the ministry never thought seriously, during the course of the war, about making any settlements on the coast of South America, which was what flattered the expectations of the people; nor was it indeed ever carried into execution, or any trade ever undertaken by this company except the Assiento, in pursuance of the treaty of Utrecht, for furnishing the Spaniards with negroes, of which this company was deprived by the late convention between the courts of Great Britain and Spain, soon after the treaty of Aix la Chapelle in 1748.

After this, some other sums were lent to the government in the reign of queen Anne at 6 per cent. In the third of George I. the interest of the whole was reduced to 5 per cent. and they advanced two millions more to the government at the same interest. By the statute of the 6th of George I it was declared that this company might redeem all or any of the reedeemable national debts, in consideration of which the company were empowered to augment their capital according to the sums they should discharge: and for enabling the company to raise such sums for purchasing annuities, exchanging for ready money new exchequer bills carrying on their trade &c. the company might, by such means as they should think proper, raise such sums of money as in a general court of the company should be judged necessary. The company were also impowered to raise money on contracts, bills, bonds, or obligations under their common seal, on the credit of their capital stock. But if the sub-governor, deputy-governor, or other members of the company, should purchase lands or revennes of the crown upon account of the corporation, or lend money by loan or anticipation on any branch of the revenue, other than such part only on which a credit of loan was granted by parliament, such sub-governor, or other member of the company, should forfeit treble the value of the money so lent.

The fatal South-Sea scheme, transacted in the year 1720, was executed upon the last mentioned statute The company had at first set out with good success, and the value of their stock for the first five years had risen faster than that of any other company; and his Majesty, after purchasing 10,000 l. stock, had condescended to be their governor. Things were in this situation, when, taking advantage of the above statute, the South Sea bubble was projected. The pretended design of which was to raise a fund for carrying on a trade to the South Seas, and purchasing annuities, &c. paid to the other companies: and propoſals were printed and distributed, shewing the advantages of the design, and inviting persons into it. The sum necessary for carrying it on, together with the profits that were to arise from it, were divided into a certain number of shares, or subscriptions, to be purchased by persons disposed to adventure therein. And the better to carry on the deception, the directors engaged to make very large dividends, and actually declared, that every 100 l original stock would yield 50 l. per annum; which occasioned so great a rise of their stock, that a share of 100 l. was sold for upward of 1000 l. This was in

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in the month of July; but before the end of September it fell to 150 l. by which multitudes were ruined, and ſuch a ſcene of diſtreſs occaſioned as is ſcarcely to be conceived. But the conſequences of this infamous ſcheme are too well known. We ſhall paſs over all the other tranſactions of this company in the reign of king George I. as not material to our preſent purpoſe.

By a ſtatue of the 6th of his late Majeſty, it was enacted, that from and after the 24th of June 1733, the capital ſtock of this company, which amounted to 14,651,103 l. 8s. 1d. and the ſhares of the reſpective proprietors, ſhould be divided into four equal parts; three-fourths of which ſhould be converted into a joint ſtock, attended with annuities, after the rate of 4 per cent. until redemption by parliament, and ſhould be called The new South Sea annuities; and the other fourth part ſhould remain in the company as a trading capital ſtock, attended with the reſidue of the annuities or funds payable at the exchequer to the company for their whole capital, till redemption; and attended with the ſame ſums allowed for charges of management, and with all effects, profits of trade, debts, privileges and advantages belonging to the South Sea company. That the accomptant of the company ſhould twice every year, at Chriſtmas and midſummer, or within one month after, ſtate an account of the company's affairs, which ſhould be laid before the next general court, in order to their declaring a dividend; and all dividends ſhould be made out of the clear profits, and ſhould not exceed what the company might reaſonably divide without incurring any farther debt; provided that the company ſhould not at any time divide more than 4 per cent. per annum, until their debts were diſcharged; and that the South Sea company, and their trading ſtock, ſhould, exclusively from the new joint annuities, be liable to all the debts and incumbrances of the company; and that the company ſhould cauſe to be kept within the city of London, an office and books, in which all transfers of the new annuities ſhould be entered and ſigned by the party making ſuch transfer, or his attorney; and the perſon to whom ſuch transfer ſhould be made, or his attorney, ſhould underwrite his acceptance, and no other method of transferring the annuities ſhould be good in law.

The annuities of this company, as well as the other, are now reduced to 3 l. per cent.

This company is under the direction of a governor, ſub-governor, deputy governor, and 21 directors; but no perſon is qualified to be governor, his Majeſty excepted, unleſs ſuch governor has, in his own name and right, 5000 l. in the trading ſtock; the ſub-governor is to have 4000 l the deputy 3000 l. and a director 2000 l. in the ſame ſtock. In every general court, every member having in his own name and right 500 l. in trading ſtock, has one vote; if 2000 l. two votes; if 3000 l three votes; and if 5000 l. four votes.

The Eaſt India Company, the Bank of England, and the South Sea Company are the only incorporated bodies to which the government is indebted, except the Million Bank, whoſe capital is only one million, conſtituted to purchaſe the reverſion of the long exchequer orders.

The intereſt of all the debts owing by the government is now reduced 3 per cent. excepting only the annuities for the years 1756 and 1758, the life-annuities, and the exchequer orders; but the South Sea company ſtill continues to divide four per cent. on their preſent capital ſtock, which they are enabled to do from the profits they make on the ſums allowed to them for management of the annuities paid at their office, and from the intereſt of annuities which are not claimed by the proprietors.

As the prices of the different ſtocks are continually fluctuating above and below par; ſo when a perſon who is not acquainted with tranſactions of that nature, reads in the papers the prices of ſtocks, where bank-ſtock is marked perhaps 127 l. India ditto 134 a 134¾. South Sea ditto 97¼, &c. he is to underſtand that a 100 l. of thoſe reſpective ſtocks ſell at ſuch a time for thoſe ſeveral ſums.

In comparing the prices of the different ſtocks one with another, it muſt be remembered, that the intereſt due on them from the time of the laſt payment, is taken into the current price; and the ſeller never receives any ſeparate conſideration for it, except in the caſe of India bonds, where the intereſt due is calculated to the day of the ſale, and paid by the purchaſer over and above the premium agreed for. But as the intereſt on the different ſtocks is paid at different times, this, if not rightly underſtood, would lead a perſon not well acquainted with them into conſiderable miſtakes in his computation of their value; ſome always having a quarter's intereſt due on them more than others, which makes an appearance of a conſiderable difference in the price, when in reality there is none at all. Thus, for inſtance, old South Sea annuities ſell at preſent for £. 85¼ or £ 85 10s. while new South Sea annuities fetch only £ 84¼, or £ 84 15 s. though each of them produce the ſame annual ſum of £ 3 per cent. but the old annuities have a quarter's intereſt more due on them than the new annuities, which amounts to 15 s. the exact difference. There is, however, one or two cauſes that will always make one ſpecies of annuities ſell ſomewhat lower than another, though of the ſame real value; one of which is, the annuities making but a ſmall capital, and there not being for that reaſon ſo many people at all times ready to buy into it as into others where the quantity is larger; becauſe it is apprehended, that whenever the government pays off the national debt, they will begin with that particular ſpecies of annuity the capital of which is the ſmalleſt

A ſtock may likewiſe be affected by the court of chancery; for if that court ſhould order the money which is under their direction to be laid out in any particular ſtock, that ſtock, by having more purchaſers, will be raiſed to a higher price than any other of the like value.

By what has been ſaid, the reader will perceive how much the credit and intereſt of the nation depends on the ſupport of the public funds. While the annuities, and intereſt for money advanced, is there regularly paid, and the principal inſured by both prince and people (a ſecurity not to be had in other nations) foreigners will lend us their property and all Europe be intereſted in our welfare; the paper of the companies will be converted into money and merchandize, and Great Britain can never want caſh to carry her ſchemes into execution.

In other nations, credit is founded on the word of the the prince, if a monarchy; or that of the people, if a republic: but here, it is eſtabliſhed on the intereſts of both prince and people; which is the ſtrongeſt ſecurity: for however lovely and engaging honeſty may be in other reſpects, intereſt in money-matters will always obtain confidence; becauſe many people pay great regard to their intereſt, who have but little veneration for virtue.

STOCKS,

STOCKS, among ſhip-carpenters, a frame of timber, and great poſts, made aſhore, to build pinnaces, ketches, boats, and ſuch ſmall craft, and ſometimes ſmall frigates. Hence we ſay, a ſhip is on the ſtocks, when ſhe is a-building.

STOCKS, a wooden machine to put the legs of offenders in, for the ſecuring of diſorderly perſons, and by way of puniſhment in divers caſes, ordained by ſtatute, *&c.*

STOEBE, in botany, a genus of the ſyngeneſia polygamia ſegregata claſs. The receptacle is paleaceous; the pappus is feathered; and every floſcule has a five-leaved calix. There is but one ſpecies, a native of Æthiopia.

STOICS, a ſect of ancient philoſophers, the followers of Zeno, thus called from the Greek STOA, which ſignifies a porch or portico, in regard Zeno uſed to teach under a portico or piazza.

To the praiſe of the Stoics in general, it muſt be confeſſed, that, leſs intent than other philoſophers upon frivolous and often dangerous ſpeculations, they devoted their ſtudies to the clearing up of thoſe great principles of morality which were the firmeſt ſupports of ſociety; but the dryneſs and ſtiffneſs that prevailed in their writings, as well as in their manners, diſguſted moſt of their readers, and abundantly leſſened their utility. Zeno's chief followers, among the Greeks, were Lucippus, Cleanthes, Chryſippus, Diogenes Babylonius, Antipater, Panætius, Poſſidonius, and Epictetus; among the Romans, Cato, Varro, Cicero, Seneca, the emperor Antoninus, *&c.* The Stoics cultivated logic, phyſics, metaphyſics, *&c.* but eſpecially ethics. The principles of their dogmata, of the former kinds, are, that there are certain catalepſias or comprehenſions, called innate ideas or principles, naturally found in the mind; that God is the ſeminal cauſe of the univerſe; and, with the Platoniſts, that the world is an animal, by reaſon of God's inhabiting and informing every part thereof; that nature is an artificial fire tending to generation; and that the world is at laſt to be deſtroyed by a conflagration. As for the morality of the Stoics, it was couched much in paradoxes; as, that a wiſe man is void of all paſſions, or perturbation of mind; that pain is no real evil, but that a wiſe man is happy in the midſt of torture, is always the ſame, and is always joyful; that there is none elſe free; that none elſe ought to be eſteemed king, magiſtrate, poet, or philoſopher; that all wiſe men are great men; that they are the only friends or lovers; that nothing can happen to them beyond their expectations; that all virtues are inſenſibly connected together; that all good things are equal, and equally to be deſired; that goodneſs admits of no increaſe or diminution. They own but one God, whom they however call by various names, as Fate, Jupiter, *&c.* by which they did not mean various things, but various powers and relations of the ſame thing. Providence they expreſſed under the name Fate, which Chryſippus defines to be a natural ſeries or compoſition of things mutually following each other, by an immutable nexus or tie, fixed from all eternity. They held the immortality of the ſoul.

STOKEGOMER, a market-town of Somerſetſhire, ſituated twenty-two miles weſt of Wells.

STOKESLY, a market-town of Yorkſhire, ſituated thirty miles north of York.

STOLBERG, a town of Germany, in the circle of Upper Saxony, and territory of Thuringia, fifty-eight miles north-weſt of Leiptic.

STOLE, a ſacerdotal ornament wore by the Romiſh pariſh-prieſts over their ſurplice, as a mark of ſuperiority in their reſpective churches; and by other prieſts, over the alb, at celebrating of maſs, in which caſe it goes a-croſs the ſtomach; and by deacons, over the left ſhoulder, ſcarf-wiſe; when the prieſt reads the goſpel for any one, he lays the bottom of his ſtole on his head. The ſtole is a broad ſwath, or ſlip of ſtuff, hanging from the neck to the feet, with three croſſes thereon.

Groom of the STOLE, the eldeſt gentleman of his Majeſty's bed chamber, whoſe office and honour it is to preſent and put on his majeſty's firſt garment, or ſhirt, every morning, and to order the things in the chamber.

Order of the STOLE, an order of knights inſtituted by the kings of Arragon. Another military order, at Venice, is called the order of the golden ſtole; thus called from a golden ſtole, which thoſe knights wore over their ſhoulder, reaching to the knee, both before and behind, a palm and a half broad. None are raiſed to this order but patricians, or noble Venetians.

STOMACH, in anatomy. See ANATOMY, p. 258.

STOMACHIC, in pharmacy, medicines that ſtrengthen the ſtomach, and promote digeſtion, *&c.*

Stomachic corroboratives are ſuch as ſtrengthen the tone of the ſtomach and inteſtines; among which are carminatives, as the roots of galangals, red gentian, zedoary, pimpinella, calamus, aromaticus, and arum. Of barks and rinds, thoſe of canella alba, ſaſſafras, citrons, Seville and China oranges, *&c.* Of ſpices, pepper, ginger, cloves, cinnamon, cardamums, and mace.

STONES, in natural hiſtory, are defined to be eſſentially compound foſſils, not inflammable, nor ſoluble in water or oil, nor at all ductile; found in continued ſtrata, or beds, of great extent; formed either of a congeries of ſmall particles, in ſome degree reſembling ſand, and lodged in a ſmoother cementitious matter; or elſe of this cementitious matter, and the gritt or ſand-like particles, running together into one ſmooth maſs; or, finally, of granules cohering by contact, without any cementitious matter among them; or compoſed of cryſtal or ſpar, uſually debaſed by earth, and often mixed with talc and other extraneous particles.

Of this claſs of foſſils there are three orders; and under theſe, eight genera.

The firſt order comprehends all the coarſe, harſh, and rough ſtones, of a lax texture, and compoſed of a viſible gritt, reſembling ſand in form, and uſually immerſed in a cementitious matter, and of little natural brightneſs; ſcarce capable of any poliſh, and naturally mouldering away in form of powder from the tools of the workmen. The genera of this order are two, *viz.* the ammochiſta and pſaduria; the former of which conſtitute our grey and rough ſlates; and the latter comprehends moſt of the ſtones uſed in building, particularly Portland ſtone.

The ſecond order conſiſts of ſtones moderately fine, of a more compact and even texture, ſcarce diſtinguiſhable conſtruction, and affording no ſand-like particles to the view; of ſome natural brightneſs, capable of a tolerable poliſh, and flying off from the tools of the workmen in form of ſmall chips. Under this order are comprehended the ſympexia and ſtegania.

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The third order conſiſts of ſtones of a very fine ſubſtance and elegant ſtructure, naturally of a great brightneſs, and capable of an elegant poliſh; compoſed of granules of various ſhapes and ſizes, but uſually flattiſh, ſometimes more, ſometimes leſs diſtinct; and, in ſome ſpecies, running together into uniform maſſes, but never lodged in any cementitious ſubſtance. Of this order are the marbles, alabaſters, porphyries, and granites.

STONE in the bladder. See MEDICINE, and SURGERY.

STONE alſo denotes a certain quantity or weight of ſome commodities.

A ſtone of beef, at London, is the quantity of eight pounds; in Hertfordſhire, twelve pounds; in Scotland, ſixteen pounds.

STONE-CHATTER, in ornithology. See MOTACILLA.

STONEHENGE, in antiquity, a famed pile or monument of huge ſtones on Saliſbury plain, ſix miles diſtant from that city.

It conſiſts of the remains of four ranks of rough ſtones, ranged one within another, ſome of them, eſpecially in the outermoſt and third rank, twenty feet high, and ſeven broad; ſuſtaining others laid acroſs their heads, and faſtened by mortiſes; ſo that the whole muſt have anciently hung together.

Antiquaries are now pretty well agreed that it was a Britiſh temple; and Dr Langwith thinks it might eaſily be made probable, at leaſt, that it was dedicated to the ſun and moon. Inigo Jones has given a fine ſcheme of the work, and ſtrives hard to perſuade the world, that it was Roman: but Dr Langwith, who took his meaſures on the ſpot, aſſures us he could by no means reconcile them with that ſcheme.

STONEY-STRATFORD, a market-town of Buckinghamſhire, fourteen miles north of Aileſbury.

STOOL, in medicine, an evacuation or diſcharge of the fæces, *&c.* by the anus.

STOPPER, in a ſhip, a piece of cable-laid rope, having a wale-knot at one end, with a laniard faſtened to it; and the other end is ſpliced round a thimble in the ring-bolts upon deck, and at the bits: its uſe is to ſtop the cable, that it may not run out too faſt; in order to which, they make turns with the laniard about the cable, and the wale-knot ſtops it, ſo that it cannot ſlip away faſter than is neceſſary.

STORAX, or STYRAX, in natural hiſtory, a dry and ſolid reſin, of a reddiſh colour, and a peculiarly fragrant ſmell; of which there are two kinds, the ſtyrax calamita, or ſtyrax in tears, and the ſtyrax vulgaris; whereof the former is by far the purer and finer kind, imported in ſmall looſe granules, or elſe in large maſſes compoſed of ſuch granules: it anciently uſed to be packed up in reeds, for the more ſecure carriage; whence the name. The common ſtorax is likewiſe a fine and pure reſin, though leſs ſo than the former; and is brought to us in large lumps, not formed of granules, but of one uniform conſiſtence.

Theſe are the two genuine kinds of ſtorax; but neither of them is that met with in our ſhops, which is a kind of ſaw-duſt connected into lumps, by juſt ſo much of the ſtorax reſin as will make the other matters hang together. This is what our apothecaries uſe, under the name of ſtorax; but it is adviſeable to ſtrain carefully the pure reſin from the filth, and uſe no part of the latter.

The two genuine kinds of ſtorax, which ought always to be uſed where they can be had, differ only in this; that the granulated ſtorax flows naturally from the ſtyrax tree, and the common kind is obtained from the ſame tree by inciſion.

Storax is brought to us from Syria, and the Eaſt-Indies; and ought to be choſen pure, very fragrant, and of an acid taſte. It is much recommended as a detergent and balſamic, in diſorders of the breaſt: it is alſo eſteemed a cordial, and is recommended in vertigoes and other diſorders of the head and nerves.

Liquid STORAX, in pharmacy, is a drug very different from the reſin above deſcribed; being a reſinous juice, of the conſiſtence of venice-turpentine, or thicker: it is, when clean, pellucid, of a browniſh colour, with a caſt ſometimes of reddiſh, and ſometimes of greyiſh in it. Its ſmell is ſomewhat like that of common ſtorax, only much ſtronger, and even diſagreeable: its taſte is acrid, aromatic, and ſomewhat bitteriſh; and it is oily, or unctuous. It ſhould be choſen thin, pellucid, of a clean brown colour, and of a very ſtrong ſmell.

STORGE, a greek term, frequently uſed for the parental inſtinct, or natural affection, which almoſt all animals bear their young; whereby they are moſt powerfully moved to defend them from dangers, and procure for them ſuitable nouriſhment.

STORK, in ornithology. See ARDEA.

STORM BIRD. See PROCELLARIA.

STORMAR, the ſouth diviſion of Holſtein, whereof Hamburgh is the chief town.

STORTFORD, a market-town of Hertfordſhire, thirty miles north of London.

STOVES, in gardening, are buildings erected for the preſervation of tender exotic plants, which, without that aſſiſtance, will not bear the cold of our winter, becauſe they require an artificial warmth.

Stoves are of two kinds, diſtinguiſhed by the names of the dry and the bark-ſtoves.

The dry ſtove has the flues, in which the ſmoke is carried, either laid under the pavement of the floor, or erected in the back part of the houſe over each other, and returned ſix or eight times all along the ſtove. In theſe ſtoves the plants are placed on ſcaffolds, and benches of boards, raiſed above one another; and the plants principally preſerved in theſe are the aloes, ceruſes, euphorbiums, tithymals, and other ſucculent plants, which are impatient of moiſture in winter, and therefore are not to be kept among trees, or herbaceous plants, which perſpire freely.

The bark-ſtoves are made with a large pit, nearly of the length of the houſe, which is three feet deep, and ſix or ſeven feet wide. This pit is to be filled with freſh tanner's bark to make a hot-bed, and in this the pots containing the tender plants are to be plunged.

STOURBRIDGE, a market-town, nineteen miles north of Worceſter.

STOUTH-RIEF, in Scots law. See LAW, Tit. xxxiii. 30.

STOW, a market-town, twenty miles eaſt of Gloceſter.

STOWAGE, in the ſea-language, the placing goods orderly in the hold of a ſhip, *viz.* the heavieſt next the ballaſt, *&c.*

STOWEY, a market-town of Somerſetſhire, eighteen miles weſt of Wells.

STOW-MARKET, a town of Suffolk, ten miles eaſt of Bury.

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STRABISMUS, SQUINTING, a diſtortion of the eyes, whereby their pupils are turned from, inſtead of being directed towards, objects at which they look: ſometimes only one eye, but more frequently both are thus affected. See MEDICINE, p. 155.

STRAIN, in ſurgery, a violent extenſion of the ſinews, or tendons, of ſome muſcle.

STRAIT, is a narrow paſſage out of one ſea into another, as thoſe of Gibraltar and Magellan.

STRAKES, in the ſea-language, ſignify the uniform ranges of planks on the bottom, decks, and ſides of ſhips; and the garboard ſtrake is that next the keel.

STRALSUND, a ſtrong city and port-town of Germany, in the circle of Upper Saxony and duchy of Pomerania, ſubject to Sweden: E. long 13° 22′, and N. lat. 54° 23′.

STRAND, ſignifies any ſhore of the ſea, or bank of a great river: hence an immunity from paying cuſtoms on goods or veſſels, was anciently expreſſed by ſtrand and ſtream.

STRANDED, among ſeamen, is ſaid of a ſhip that is driven aſhore by a tempeſt, or runs on ground through ill ſteerage, and ſo periſhes.

STRANGFORD, a town of Ireland, that gives name to a loch and bay in the county of Down and province of Ulſter, ſituated nine miles eaſt of Down.

STRANGURY, in medicine a ſuppreſſion of urine. See MEDICINE, p. 160.

STRANRAER, a parliament-town of Scotland, ſituated in the ſhire of Galloway on a bay of the frith of Clyde.

STRAPS *of a ſaddle*, are ſtrong leather-thongs, nailed to the bows of a ſaddle, in order to make the girths, *&c.* faſt.

STRAPADO, a kind of military puniſhment, wherein the criminal is hoiſted up by a rope, and let down, ſo that, by the weight of his body in the fall, his arms are diſlocated

STRASBURG, a free imperial city of Germany, capital of the landgraviate of Alſace, ſituated near the weſtern bank of the Rhine, in E. long. 7° 35′, and N lat. 48° 38′.

STRATA, in natural hiſtory, the ſeveral beds or layers of different matters, whereof the body of the earth is compoſed.

The ſtrata include all the layers of earths, minerals, metals, ſtones, *&c.* lying under the upper tegument, or ſtratum, the turf or mould.

The time when theſe ſeveral ſtrata were laid, was doubtleſs at the creation; unleſs, with ſome great naturaliſts, as Steno, Dr. Woodward, *&c* we ſuppoſe the globe of the earth to have been diſſolved by the deluge.

STRATAGEM, in the art of war, any device for the deceiving and ſurpriſing an enemy.

STRATEGUS, in Grecian antiquity, an annual officer among the Athenians, whereof there were two choſen, to command the troops of the ſtate.

STRATFORD, a populous market-town of Warwickſhire, ſituated on the river Avon, ſix miles ſouth of Warwick; remarkable for being the birth-place of the inimitable Shakeſpeare, and lately for the Jubilee held there in honour of his memory, September 1769.

STRATHNAVER, a ſubdiviſion or diſtrict of the county of Sutherland, in Scotland, having the Caledonian ocean on the north and weſt.

STRATIFICATION, in chemiſtry, the ranging any thing to be calcined in ſeveral layers or ſtrata one above another.

STRATIOTES, in botany, a genus of the polyandria hexagynia claſs. The ſpatha conſiſts of two leaves, and the perianthium of three ſegments, the corolla has three petals, and the berry has ſix cells. There are two ſpecies, one of them, *viz.* the aloides, water-aloe, or freſh-water ſoldier, a native of Britain.

STRATTON, a market-town of Cornwal, ſituated a little ſouth of the Briſtol channel, fourteen miles north-weſt of Launceſton.

STRAWBERRY, in botany. See FRAGARIA.

STRAWBERRY-TREE, in botany. See ARBUTUS.

STRENGTH, in phyſiology, the ſame with force or power.

STRENGTHENERS, in pharmacy, medicines that add to the bulk and firmneſs of the ſolids: and ſuch are all abſorbent, agglutinant, and aſtringent medicines.

STRIÆ, in the ancient architecture, the ſame with the flutings of columns. See FLUTES.

STRIATED LEAF, among botaniſts, one that has a number of longitudinal furrows on its ſurface.

STRIGONENSIS TERRA, *earth of Strigonium*, in the materia medica, a red earth, of the bole kind, found about the gold-mines at Strigonium in Hungary, and uſed in ſome places as an aſtringent and ſudorific.

It is but of a coarſe and impure texture, and lighter than moſt of the boles in colour; it is of a ſtrong, but dull red, and is of a tolerably ſmooth ſurface; it is apt to crumble to pieces between the fingers, and ſtains the ſkin in handling; it melts freely in the mouth, and has a remarkable ſmoothneſs, but very little aſtringency in its taſte, and leaves a ſenſible grittineſs between the teeth; it is ſometimes veined and ſpotted with ſmall moleculæ of an earth, like the whitiſh variegations of the red French bole.

STRIKE, a meaſure of capacity, containing four buſhels.

STRIKE, among ſeamen, is a word variouſly uſed: when a ſhip, in a fight, or on meeting with a ſhip of war, lets down or lowers her top-ſails, at leaſt half-maſt high, they ſay ſhe ſtrikes, meaning ſhe yields, or ſubmits, or pays reſpect to the ſhip of war. Alſo, when a ſhip touches ground, in ſhoal-water, they ſay ſhe ſtrikes. And when a top-maſt is to be taken down, the word of command is, Strike the top-maſt, *&c.*

STRIX, in ornithology, a genus belonging to the order of accipitres. The bill is hooked, but has no cere or wax; the noſtrils are covered with ſetaceous feathers; the head is very large, as are alſo the ears and eyes; and the tongue is bifid. There are twelve ſpecies, comprehending all the owl-kind. They are night-birds, and feed upon mice, bats, *&c.*

STROBILUS, among botaniſts. See BOTANY, p. 637.

STROMATEUS, in ichthyology, a genus belonging to the order of apodes. The head is compreſſed, the teeth are in the jaws and palate; the body is oval, and ſhiny; and the tail is forked. There are two ſpecies.

STROMBOLI, one of the Lipari iſlands, fifty miles north of Meſſina.

STRONGOLI, a town of the Hither Calabria, in the kingdom of Naples, ſituated on the gulph of Tarento.

STROPHE, in ancient poetry, a certain number of verſes, including a perfect ſenſe, and making the firſt part of an ode.

STROUD, a market-town, nine miles ſouth of Gloceſter.

STRUMÆ,

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STRUMÆ, ſcrophulous tumours ariſing on the neck and throat, conſtituting what is commonly called the king's evil See MEDICINE, p. 137, &c.

STRUTHIO, the OSTRICH in ornithology, a genus belonging to the order of grallæ. The bill is ſomewhat conical; the noſtrils are oval; the wings are ſhort, and not fit for flying; and the feet are of the running kind. There are three ſpecies. The camelus, or common oſtrich, is a native of Syria, Arabia, Lybia, and Africa. This is the largeſt of all birds; it runs ſwifter than any animal; it lays about 50 eggs in the ſand, and ſits upon them only during the night, the heat of the ſun being ſufficient during the day.

STRYCHNOS, in botany, a genus of the pentandria monogynia claſs. The corolla conſiſts of five ſegments; and the berry has but one cell. There are two ſpecies, both natives of Britain.

STUCCO, in building, a compoſition of white marble, pulverized and mixed with plaſter of lime; and the whole being ſifted and wrought up with water, is to be uſed like common plaſter: this is what Pliny means by marmoratum opus, and albarium opus.

STUFF, in commerce, a general name for all kinds of fabricks of gold, ſilver, ſilk, wool, hair, cotton, or thread, manufactured on the loom; of which number are velvets, brocades, mohairs, ſattins, taffeties, cloths, ſerges, &c.

STUM, in the wine-trade, denotes the unfermented juice of the grape, after it has been ſeveral times racked off and ſeparated from its ſediment. The caſks are, for this purpoſe, well matched, or fumigated with brimſtone every time, to prevent the liquor from fermenting, as it would otherwiſe readily do, and become wine.

STUPOR, a numbneſs in any part of the body, whether occaſioned by ligatures obſtructing the blood's motion, by the palſy, or the like.

STUPHA, or STUPE, in medicine, is a piece of cloth dipped in ſome proper liquor, and applied to an affected part, by way of fomentation or epithem.

STURGEON. See ACCIPENSER.

STURMINSTER, a market town, eighteen miles north of Dorcheſter.

STURNUS, the STARLING, in ornithology, a genus belonging to the order of paſſeres. The beak is ſubulated, depreſſed, and ſomewhat blunt; the ſuperior mandible is entire, and ſomewhat open at the edges; the noſtrils are marginated above; and the tongue is ſharp and emarginated. There are five ſpecies, diſtinguiſhed by their colour.

STYLE, a word of various ſignifications, originally deduced from STYLOS, a kind of bodkin, wherewith the ancients wrote on plates of lead, or on wax, &c. and which is ſtill uſed to write on ivory-leaves, and paper prepared for that purpoſe, &c.

STYLE, in dialling, denotes the gnomon or cock of a dial, raiſed on the plane thereof, to project a ſhadow. See DIALLING.

STYLE, in botany. See BOTANY, p. 637.

STYLE, in matters of language, a particular manner of expreſſing one's thoughts agreeably to the rules of ſyntax; or, as F. Buffier more accurately defines it, the manner wherein the words, conſtructed according to the laws of ſyntax, are arranged among themſelves, ſuitably to the genius of the language. See COMPOSITION.

STYLE, in juriſprudence, the particular form or manner of proceeding in each court of juriſdiction, agreeable to the rules and orders eſtabliſhed therein: thus we ſay the ſtyle of the court of Rome, of Chancery, of Parliament, of the Privy council, &c.

Old STYLE, the Julian manner of computing time, as the *New*-STYLE is the Gregorian method of computation. See ASTRONOMY, p. 490.

STYLET, a ſmall dangerous kind of poinard, which may be concealed in the hand, chiefly uſed in treacherous aſſaſſinations. The blade is uſually triangular, and ſo ſlender that the wound it makes is almoſt imperceptible.

STYLITES, an appellation given to a kind of ſolitaries, who ſpend their lives ſeated on the tops of columns, to be, as they imagine, the better diſpoſed for meditation, &c. Of theſe we find ſeveral mentioned in ancient writers, and even as low as the eleventh century The founder of the order was St. Simon Stylites, a famous anchoret in the fifth century, who took up his abode on a column ſix cubits high; then on a ſecond, of twelve cubits: a third, of twenty-two; and, at laſt, on another of thirty-ſix. The extremity of theſe columns were only three feet in diameter, with a kind of rail or ledge about it that reached almoſt to the girdle, ſomewhat reſembling a pulpit. There was no lying down in it. The faquirs, or devout people of the eaſt, imitate this extraordinary kind of life even to this day.

STYLOGLOSSUS, in anatomy. See ANATOMY, p. 304.

STYLOHYOIDÆUS, in anatomy. See ANATOMY, p. 304.

STYLOIDES, in anatomy. See ANATOMY, p 155.

STYLOPHARYNGÆUS, in anatomy. See ANATOMY, p. 304

STYPTIC, in pharmacy, medicines which by their aſtringent qualities ſtop hæmorrhages.

STYRAX, in botany, a genus of the dodecandria monogynia claſs The calix conſiſts of five teeth, and the corolla of one funnel-ſhaped petal; and the drupa has one cell, containing two ſeeds. There is but one ſpecies, a native of Syria. See STORAX

SUBALTERN, a ſubordinate officer, or one who diſcharges his poſt under the command, and ſubject to the direction of another: ſuch are lieutenants, ſub-lieutenants, cornets and enſigns, who ſerve under the captain.

SUBBUTEO, in ornithology. See FALCO.

SUBCLAVIAN, in anatomy, is applied to any thing under the arm-pit or ſhoulder, whether artery, nerve, vein, or muſcle

SUBCOSTAL MUSCLES See ANATOMY, p. 215.

SUBER, in botany. See QUERCUS.

SUBJECT, a perſon under the rule and dominion of a ſovereign prince or ſtate.

SUBJECT, is alſo uſed for the matter of an art or ſcience, or that which it conſiders, or whereon it is employed: thus the human body is the ſubject of medicine.

SUBJUNCTIVE, in grammar. See GRAMMAR.

SUBLIMATE, a chemical preparation, the baſis whereof is mercury or quick-ſilver. See CHEMISTRY, p. 138.

SUBLIMATION, the condenſing and collecting in a ſolid form, by means of veſſels aptly conſtructed, the fumes of bodies raiſed from them by the application of a proper heat. See CHEMISTRY, p. 138.

SUBLINGUAL GLANDS. See ANATOMY, p. 307.

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SUBMISSION, in Scots law. See LAW, Tit. xxxii. 15.
SUBORDINATION, a relative term, expreſſing the degree of inferiority between one thing and another.
SUBORNATION OF PERJURY, in Scots law. See LAW, Tit. xxxiii. 35.
SUBPOENA, in law, a writ whereby all common perſons, or thoſe under the degree of peerage, may be called into chancery, in any caſe where the law cannot afford a remedy.
SUBREPTION, the act of obtaining a favour from a ſuperior, by ſurpriſe or a falſe repreſentation.
SUBREPTITIOUS, a term applied to a letter, licence, patent, or other act, fraudulently obtained of a ſuperior, by concealing ſome truth, which, had it been known, would have prevented the conceſſion or grant.
SUBROGATION, in the civil law, the act of ſubſtituting a perſon in the place, and entitling him to the rights of another.
SUBSCAPULARIS, in anatomy. See ANATOMY, p. 196.
SUBSCRIPTION, in general, ſignifies the ſignature put at the bottom of a letter, writing, or inſtrument.
SUBSEQUENT, ſomething that comes after another, particularly with regard to the order of time.
SUBSIDY, in law, ſignifies an aid or tax granted to the king, by parliament, for the neceſſary occaſions of the kingdom; and is to be levied on every ſubject of ability, according to the rate or value of his lands or goods: but this word, in ſome of our ſtatutes, is confounded with that of cuſtoms.
SUBSISTENCE, in the military art, is the money paid to the ſoldiers weekly, not amounting to their full pay; becauſe their cloaths, accoutrements, tents, bread, &c. are to be paid.
SUBSTANCE, ſomething that we conceive to ſubſiſt of itſelf, independently of any created being, or any particular mode or accident. See METAPHYSICS.
SUBSTANTIAL, in the ſchools, ſomething belonging to the nature of ſubſtance.
SUBSTANTIVE, in grammar. See GRAMMAR.
SUBSTITUTE, a perſon appointed to officiate for another, in caſe of abſence or other legal impediment.
SUBSTITUTION, in the civil-law, a diſpoſition of a teſtament, whereby the teſtator ſubſtitutes one heir for another, who has only the uſufruit, and not the property of the thing left him.
SUBSTRACTION, in arithmetick. See ARITHMETICK, p. 370.
SUBSTRACTION, in algebra. See ALGEBRA, p. 81.
SUBTENSE, in geometry, the ſame with the chord of an arch. See CHORD.
SUBTERRANEOUS, whatever is under-ground: thus, naturaliſts ſpeak of ſubterraneous fires, damps, &c.
SUBTILE, in phyſics, an appellation given to whatever is extremely ſmall, fine, and delicate; ſuch as the animal ſpirits, the effluvia of odorous bodies, &c. are ſuppoſed to be.
SUBULARIA, in botany, a genus of the tetradynamia ſiliculoſa claſs. The pod is entire, oval, with oval concave valves; and the ſtylus is ſhorter than the pod. There is but one ſpecies, *viz.* the aquatica, or awl-wort, a native of Britain.
SUBULATED, ſomething in the ſhape of an awl.
SUCCEDANEUM, in pharmacy, denotes a drug ſubſtituted in the place of another, in medical compoſition.
SUCCESSION, in philoſophy, an idea which we get by reflecting on that train of ideas conſtantly following one another in our minds when awake.
SUCCESSION, in Scots law. See LAW, Tit. xxvii. 1, &c. xxviii. 1, &c.
SUCCESSOR, in law, one that ſucceeds, or comes in the place of another.
SUCCINUM, in natural hiſtory. See AMBER.
SUCCISA, in botany. See SCABIOSA.
SUCCORY, in botany. See CICHORIUM.
SUCCUBUS, a term uſed by ſome imaginary writers, for a dæmon who aſſumes the ſhape of a woman, and as ſuch lies with a man; in which ſenſe, it ſtands oppoſed to incubus, which was a dæmon in form of a man, that they ſuppoſed to lie with a woman.

But the truth is, the ſuccubus is only a ſpecies of the incubus, or night-mare. See MEDICINE, p. 157.

SUCCULA, in mechanics, a bare axis, or cylinder, with ſtaves to move it round; but without any tympanum or peritrochium.
SUCCULENT PLANTS, thoſe whoſe leaves are thick, and abound with juice
SUCHUEN, a province of China, bounded by that of Xenſi on the north, by Honam and Huquam on the eaſt, by Quecheu and Yunam on the ſouth, and by the mountains of India on the weſt: its chief town is Chingtu.
SUCKERS, in gardening, the ſame with off-ſets. See OFF-SETS.
SUCTION, the act of ſucking or drawing up a fluid, as air, water, milk, or the like, by means of the mouth and lungs. See PNEUMATICS, and HYDROSTATICS.
SUDATORY, a name given by the ancient Romans to their hot or ſweating-rooms; ſometimes alſo called laconica.
SUDBURY, a borough-town of Suffolk, thirteen miles ſouth of Bury. It ſends two members to parliament.
SUDORIFIC, an appellation given to any medicine that cauſes or promotes ſweat.
SUEZ, a port-town of Egypt, ſituated at the bottom of the Red-ſea, ſeventy miles eaſt of Cairo: it is from this town that the iſthmus of Suez, which joins Africa to Aſia, takes its name.
SUFFOCATION, in medicine, the privation of reſpiration, or breathing; which is ſometimes occaſioned by a congeſtion of blood in the lungs, ſo as to prevent the ingreſs of the air.
SUFFOLK, a county of England, bounded by Norfolk on the north, by the German-ſea on the eaſt, by Eſſex, from which it is ſeparated by the river Maningtree, on the ſouth, and by Cambridgeſhire on the weſt; being ſixty two miles long, and twenty-eight broad.
SUFFRAGAN, an appellation given to ſimple biſhops, with reſpect to archbiſhops, on whom they depend, and to whom appeals lie from the biſhops courts.
SUFFRAGE, denotes a vote given in an aſſembly, where ſomething is deliberated on, or where a perſon is elected to an office or benefice.
SUFFRUTEX, among botaniſts, denotes an under-ſhrub, or the loweſt kind of woody plants, as lavender, rue, &c.
SUGAR, in natural hiſtory, is properly the eſſential ſalt of the ſugar-cane, as tartar is of the grape. See CHEMISTRY, p. 161. and SACCHARUM.

This plant riſes to eight, nine, or more feet high; the ſtalk,

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ſtalk, or cane, being round, jointed, and two or three inches in diameter at the bottom: the joints are three or four inches aſunder, and in a rich ſoil more: the leaves are long and narrow, and of a yelloviſh green colour; as is alſo the ſtalk itſelf, the top of which is ornamented with a panicle, or cluſter of arundinaceous flowers, two or three feet in length.

They propagate the ſugar-cane, by planting cuttings of it in the ground in furrows, dug parallel for that purpoſe; the cuttings are laid level and even, and are covered up with earth; they ſoon ſhoot out new plants from their knots or joints: the ground is to be kept clear, at times, from weeds; and the canes grow ſo quick, that in eight, ten, or twelve months, they are fit to cut for making of ſugar from them. The manner of doing it is thus: They cut off the reeds at one of the joints near the roots; they are then cleared of the leaves, and tied up in bundles, and ſent to the mills, which are worked either by water or horſes.

The ſugar-mill is compoſed of three rollers of an equal ſize, and all armed with iron-plates, where the canes are to paſs between them; only the middle roller is much higher than the reſt, to give the larger ſweep to the two poles to which the horſes are yoked. This great roller in the middle is furniſhed with a cog full of teeth, which catch the notches in the two ſide-rollers, and force them about to bruiſe the canes, which paſs quite round the great roller, and come out dry and ſqueezed from all their juice; which runs into a veſſel or back under the mill, and is thence conveyed through a narrow ſpout into the firſt boiler.

After the juice is let out of the firſt veſſel, it is received into another; in which it is boiled more briſkly, and ſcummed from time to time with a large kind of ſpoon, pierced with holes to let the liquor through, while it retains the ſcum and foulneſs ſeparated from it in boiling: towards the end of this boiling, they throw into it a ſtrong lixivium of wood-aſhes, with ſome quick-lime among it: this greatly promotes the ſeparation of the foulneſs that yet remains amongſt it; and, after it has boiled ſome time with this addition, they ſtrain it off. The fæces left in the cloths make a kind of wine, when fermented properly with water. The ſtrained liquor, which is now tolerably clean, is let into a third boiler, in which it is boiled down to the conſiſtence of ſugar over a very briſk fire, the people who attend it continually ſtirring and ſcumming it.

Great caution is to be uſed that the boiling matter does not riſe over the ſides of the veſſel, which would be of very dangerous conſequence: they prevent this by taking up quantities of the boiling matter with a ladle, lifting it up high, and letting it run in again, and by now and then adding a ſmall piece of butter, or fat of ſome kind, which takes down the bubbling almoſt inſtantaneouſly. They are very careful that no lemon-juice, or any other acid of that kind, comes near the veſſels, a very ſmall admixture of that being ſufficient to keep the matter from granulating. When the liquor is boiled enough, which is known by its concreting on throwing a ſpoonful of it up into the air, it is then let out into a fourth veſſel, under which there is a very gentle fire, only kept up that it may have leiſure to granulate; when it has begun to granulate, it is let out of this laſt boiler into a kind of conic earthen veſſels, open at both ends; the wideſt aperture is placed upwards, and the ſmaller end downwards, its aperture being ſtopped with a wooden plug. It is left in theſe veſſels twenty-four hours to concrete: after this they are removed into ſugar-houſes, and are there arranged in regular order, with a veſſel of earthen-ware under each; the plug is then taken out of the bottom aperture of each, and they are left in this condition for about forty days, that all the thick liquor, or melaſſes, may run from them: after they have ſtood thus long to drain of themſelves, a quantity of clay is diluted, with water, into a thin paſte; and this is poured on the top of every parcel of ſugar in the veſſels, ſo as to cover it two or three inches deep. This water, by degrees, all leaves the clay, and penetrating into the maſs of ſugar, runs through it, and carries off yet more of this foul thick liquid with it, into the veſſels placed underneath to receive it

When the clay is quite dry, it is taken off, and the firſt preparation of the ſugar is now finiſhed; they ſhake it out of the veſſels; and, cutting it into lumps, which are of a dirty, browniſh, or greyiſh colour, they put it up in hogſheads, and other caſks, under the name of grey or brown ſugar. The ſugar, in this ſtate, ought to be dry, not unctuous, and to have no taſte of burning. The liquor which has run from the ſugar in ſtanding, is boiled to a conſiſtence, and ſold under the name of melaſſes, or treacle; this affords, by fermentation, a very clean and good ſpirit.

This coarſe ſugar is afterwards refined to various degrees of purity by new ſolutions, and is ſold at different prices, and under different names, according to the degree of purity it is brought to. Our ſugar refiners firſt diſſolve it in water, then clarify the ſolution by boiling with whites of eggs and deſpumation; and after due evaporation pour it into moulds; where the fluid part being drained off, and the ſugar concreted, its ſurface is covered with moiſt clay, as before. The ſugar thus once refined, by repetition of the proceſs becomes the double-refined ſugar of the ſhops. The candy-ſugar, or that in cryſtals, is prepared by boiling down ſolutions of ſugar to a certain pitch, and then removing them into a hot room, with ſticks placed acroſs the veſſel for the ſugar to ſhoot upon: and theſe cryſtals prove of a white or brown colour, according as the ſugar uſed in the proceſs was pure or impure.

SUGILLATION, in medicine, an extravaſation of blood in the coats of the eye, which at firſt appears of a reddiſh colour, and afterwards livid or black. If the diſorder is great, bleeding and purging are proper, as are diſcutients.

SUIT, in law, is uſed in different ſenſes; as, 1. For an action, whether perſonal or real. 2. Suit of court, or ſuit-ſervice, which is an attendance the tenant owes to his lord's court. 3. Suit-covenant, where a perſon has covenanted to do ſervice in the court of the lord. 4. Suit-cuſtom, which is where one and his anceſtors have owed ſuit time out of mind. 5. It is uſed for a petition to the king, or any perſon of dignity; where a lord diſtrains his tenant for ſuit, and none is due; in this caſe, the party may have an attachment againſt him to appear in the king's court. 6. Suit of the king's peace, is an action brought againſt a perſon for breach of the king's peace; as in the caſe of treaſons, felonies, or treſpaſſes.

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SULPHUR. See CHEMISTRY, p. 72, 118.

SULTAN, a title of honour, given to the emperor of the Turks. The wife of a ſultan is called ſultana, and the favourite one hhaſeki-ſultana, *i. e.* the private ſultana.

SUM, ſignifies the quantity that ariſes from the addition of two or more magnitudes, numbers, or quantities together. See ARITHMETICK.

SUMACH, in botany. See RHUS.

SUMATRA, an iſland in the Eaſt-indian ocean, ſituated between 93° and 104° E. long. and between 5° 30′ N. lat. and 5° 30′ S. lat. extending from north-weſt to ſouth-eaſt, nine hundred miles long, and from one hundred to one hundred and fifty broad.

SUMMARY, in matters of literature. See ABRIDGEMENT.

SUMMER, one of the ſeaſons of the year, commencing in theſe northern regions on the day the ſun enters Cancer, and ending when he quits Virgo. See ASTRONOMY, p. 554.

SUMMIT, the top or vertex of any body, or figure; as of a triangle, cone, pyramid, *&c.*

SUMMONS, in Scots law. See LAW, Tit. XXX. 28.

SUN, in aſtronomy. See ASTRONOMY, p. 435.

SUN-FLOWER, in botany. See HELIANTHUS.

SUNDA-ISLANDS, thoſe ſituated near the ſtraits of Sunda, in the Indian ocean; the chief of which are Borneo, Java, Sumatra, *&c.* See BORNEO, *&c.*

SUNDAY, or the LORD'S-DAY, a ſolemn feſtival obſerved by Chriſtians on the firſt day of every week, in memory of our Saviour's reſurrection.

This is the principal and moſt noted of the Chriſtian feſtivals, and was obſerved with great veneration in the ancient church, from the time of the apoſtles, who themſelves are often ſaid to have met on that day for divine ſervice. It is likewiſe called the Sabbath-day, as being ſubſtituted in the room of the Jewiſh ſabbath. See SABBATH.

The ancients retained the name Sunday, or *dies ſolis*, in compliance with the ordinary forms of ſpeech, the firſt day of the week being ſo called by the Romans, becauſe it was dedicated to the worſhip of the ſun.

SUNDERLAND, a port-town of Durham, ſituated on the German ſea, at the mouth of the river Ware, ten miles north-eaſt of Durham city.

SUNTGOW, a territory in the circle of the upper Rhine in Germany, bounded by Alſace on the north; by the river Rhine, which divides it from the Briſgow, on the eaſt; by Switzerland on the ſouth; and by Franche-Compte on the weſt.

SUOVETAURILIA, an ancient Roman ſacrifice, ſo called becauſe it conſiſted of a pig (*ſus*), a ſheep, or rather ram (*ovis*), and a bull (*taurus*.) They were all males, to denote the maſculine courage of the Roman people. It was likewiſe called ſolitaurilia, becauſe the animals offered up were always (*ſolida*) whole or uncut.

SUPERCARGO, a perſon employed by merchants to go a voyage, and overſee their cargo, or lading, and diſpoſe of it to the beſt advantage.

SUPERCILIUM, in anatomy. See ANATOMY, p. 294.

SUPEREROGATION, in theology, what a man does beyond his duty, or more than he was commanded to do

SUPERFETATION, a ſecond, or after conception, happening, when the mother, already pregnant, conceives of a latter coition; ſo that ſhe bears at once two fœtuſes of unequal age and bulk, and is delivered of them at different times. We meet with inſtances of ſuperfœtations in Hippocrates, Ariſtotle, Du Laurens, *&c.* But they are ſaid to be much more frequent in hares and ſows. Naturaliſts hold, that female rats are frequently born with young rats in their wombs; and we are told of extraordinary inſtances of this kind in the female part of the human ſpecies, by Bartholine, Mentzelius, and in the hiſtory of the Royal Academy of Sciences.

SUPERFICIES, or SURFACE, in geometry, a magnitude conſidered as having two dimenſions; or extended in length and breadth, but without thickneſs or depth.

SUPERFINE, in the manufactories, a term uſed to expreſs the ſuperlative fineneſs of a ſtuff; thus a cloth, a camblet *&c.* are ſaid to be ſuperfine, when made of the fineſt wool, *&c* or when they are the fineſt that can be made.

SUPERINTENDANT, in the French cuſtoms, an officer who has the prime management and direction of the finances or revenues of the king.

SUPERIOR, ſomething raiſed above another, or that has a right to command another.

SUPERIOR, in Scots law. See LAW, Tit. X 3.

SUPERLATIVE, in grammar, one of the three degrees of compariſon, being that inflection of nouns-adjective that ſerves to augment and heighten their ſignification, and ſhews the quality of the thing denoted to be in the higheſt degree. See GRAMMAR.

SUPERNUMERARY, ſomething over and above a fixed number. In ſeveral of the offices are ſupernumerary clerks, to be ready on extraordinary occaſions.

SUPERSEDEAS, in law, is a writ which lies in divers caſes, and in general ſignifies a command to ſtay ſome of the ordinary proceedings in law, which, on good cauſe ſhewn, ought not to proceed.

SUPERSTITION, extravagant devotion, or religion wrong directed or conducted.

SUPERVISOR, a ſurveyor or overſeer.

It was formerly, and ſtill remains, a cuſtom among ſome perſons, to appoint a ſupervifor of a will, to ſee that the executors thereof do punctually obſerve and perform the ſame.

SUPINATION, in anatomy, the action of a ſupinator-muſcle, or the motion whereby it turns the hand ſo as that the palm is lifted up towards heaven.

SUPINATOR, in anatomy. See ANATOMY, p. 198.

SUPPLEMENT, in matters of literature, an appendage to a book, to ſupply what is wanting therein.

SUPPORTED, in heraldry, a term applied to the upper-moſt quarters of a ſhield when divided into ſeveral quarters, theſe ſeeming as it were ſupported or ſuſtained by thoſe below. The chief is ſaid to be ſupported when it is of two colours, and the upper colour takes up two thirds of it. In this caſe it is ſupported by the colour underneath.

SUPPORTERS, in heraldry, figures in an atchievement placed by the ſide of the ſhield, and ſeeming to ſupport or hold up the ſame. Supporters are chiefly figures of beaſts: figures of human creatures, for the like purpoſe, are properly called tenants

SUPPOSITORY, a kind of medicated cone, or ball, which is introduced to the anus for opening the belly. Suppoſitories

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ſtories are uſually made of ſoap, ſugar, alum, or a piece of tallow-candle, about the length of a man's thumb and the breadth of a finger, though they may be made ſmaller for children, and ſometimes a little thicker for adults.

SUPPRESSION. in law, the extinction or annihilating of an office, right, rent, or the like.

SUPPRESSION, in medicine, is generally uſed for a retention of urine or the menſes. See MEDICINE, p. 160, 162.

SUPPURATION, the ſecond way wherein an inflammation terminates, being a converſion of the inſpiſſated blood and the ſoft adjacent parts, as the veſſels and fat, into pus, or matter: which diſorder, when it has not yet found an opening, is generally called an abſceſs. See MEDICINE. and SURGERY.

SUPPURATIVES, or SUPPURATING MEDICINES, ſuch as promote ſuppuration. See the preceding article.

SUPRACOSTALES, in anatomy. See ANATOMY, p. 215.

SUPRALAPSARY. in theology, a perſon who holds that God, without any regard to the good or evil works of men, has reſolved, by an eternal degree, to ſave ſome and damn others. Theſe are alſo called antelapſaries, and are oppoſed to ſublapſaries and infralapſaries.

SUPRASPINATUS, in anatomy. See ANATOMY, p. 196.

SUPREMACY, the ſuperiority or ſovereignty of the king.

SURAT, a city and port-town of Hither India, in the province of Guzurat, or Cambaya, ſituated on the river Tapte, ten miles eaſt of the Indian ſea: in E. long. 72° 20′, N. lat. 21° 30′.

SURCHARGE, the ſame with overcharge, and whatever is above that which is juſt and right.

SURCOAT, a coat of arms to be worn over the body armour.

The ſurcoat is properly a looſe thin taffaty coat, with arms embrodered or painted on it, ſuch as is worn by heralds: anciently alſo uſed by military men over their armour, to diſtinguiſh themſelves by.

SURCULUS, in the anatomy of plants, a word uſed to expreſs that part of the branching of the ribs of a leaf, which is of a middle kind betwixt the great middle rib and the ſmalleſt reticular ramifications.

SURD. See ALGEBRA, p. 95

SURETY, in law, generally ſignifies the ſame with bail. See BAIL.

SURFACE. See SUPERFICIES.

SURFEIT, in medicine a ſickneſs proceeding from the ſenſation of a load at the ſtomach, uſually attended with eruptions, and ſometimes with a fever. See MEDICINE.

SURGE, in the ſea-language, the ſame with wave. See WAVE.

Alſo when heaving at the capſtan, if the cable royal or meſſenger ſlip a little, they call it ſurging.

SURGERY.

SURGERY, the art of curing all manner of wounds, and other diſorders, where the application of the hand, aſſiſted by proper inſtruments, is neceſſary.

Of PHLEBOTOMY.

WE begin with the operation of phlebotomy: becauſe it is of all the moſt general, performed in moſt parts of the body, and by much the moſt frequent in uſe at this preſent day. By phlebotomy, or bleeding, we here intend the opening a vein, by a ſharp-edged and pointed inſtrument of ſteel, for extracting a proper quantity of blood, either for the preſervation or recovery of a perſon's health.

It is commonly enough known, that the operation of bleeding in the arm is performed on the veins that lie on the internal part of the cubit. There are ſeveral things worthy the ſurgeon's notice in this operation ſome of which regard the things which are to be done preparatory to bleeding, ſome in the operation itſelf, others immediately after the performance of it. Preparatory to bleeding you ſhould have in readineſs (1.) A linen fillet, about an ell in length, and two fingers in breadth. (2.) Two ſmall ſquare bolſters. (3.) Porringers or veſſels to receive the blood. (4) A ſponge with warm water. (5.) Some vinegar, wine, or Hungary water, to raiſe the patient's ſpirits if he ſhould be inclinable to faint (6) Two aſſiſtants one to hold the porringer, the other to reach you anything that you ſhall want. (7.) You muſt place your patient upon a couch; or, if he is very fearful of the operation, lay him upon a bed, leſt he ſhould fall into a ſwoon. Laſtly the operator ſhould be as expert in bleeding with his left hand as with his right: For, as you are readier at bleeding in the right arm with your right hand, ſo when you are to open the veins of the left arm, you will find it neceſſary to uſe your left hand.

Though the operation is to be performed at once, with one puncture, yet many things are to be obſerved in order to render it ſucceſsful. Firſt, it is neceſſary for the ſurgeon to inſpect his patient's arm diligently, that he may ſee the courſe of the veins: he muſt then take hold of the arm, and extend it towards his breaſt, tucking up the ſleeve about a hand's breadth above the bend of the cubit, where he muſt make his ligature, rolling the fillet twice round, and faſtening it with a knot. The veins being compreſſed, and the blood being ſtopped in its return, they will enlarge, and lie fairer to the eye. When you have bound up the arm in this manner, you let it go for a ſmall time till the veins grow turgid. You are then to lay hold of the arm again in the ſame manner as we directed before, and extend it to your breaſt, having an aſſiſtant ready with the veſſel in his hand, at a convenient diſtance for receiving the blood.

You are now to examine which vein lies faireſt, and is therefore moſt proper to be opened. For you muſt obſerve, that in the arm there uſually appear three principal veins The firſt is called *Vena Cephalica* and is found in the external part of the arm The ſecond is termed *Baſilica*, and lies on the internal part of the arm: In the right arm it is alſo called *Hepatica*; in the left, *Splenitica*. The third, which is obliquely ſituated between the former two, is called *Mediana*. The median and baſilic veins, as they are larger than the cephalic, diſcharge a greater quantity of blood, but are attended with more danger in the operation:

For

For a conſiderable artery and the brachial nerve lie under the baſilic vein, and the tendon of the biceps muſcle under the median. But as they lie fairer to the eye, and are therefore more frequently the ſubjects of the operations we are treating of than the cephalic vein, it is ſafer and more eligible for the leſs experienced ſurgeons to open the baſilic, or at leaſt the median vein.

When you have determined which vein to open, you are to perform the operation on that part which preſents itſelf faireſt to you. But if the vein has frequently been opened, and the part which appears largeſt and faireſt is full of cicatrices, you are not to open above, but below the cicatrices, by which means the blood will diſcharge itſelf more freely: For the part above is generaly ſtraitened by the cicatrix.

Before you apply the lancet to the ſkin, when the veins are not riſen, it will be proper to rub the arm below the bandage, which will drive the blood back towards the cubit, and render the veins more turgid. Whilſt this is doing in the right arm, the ſurgeon ſhould take hold of the patient's arm in ſuch a manner that he may lay his thumb upon the vein he intends to open, to prevent the blood from flowing back, and to keep the vein from rolling. You are now to fix your eye upon that part of the vein which you intend to open, and taking the lancet with your right hand, ſo placed that the thumb and firſt finger may be fixed about the middle of the blade; the other fingers ſhould reſt gently upon the patient's arm, to prevent your hand from ſlipping.

Your lancet is now to be puſhed lightly and carefully forward by your thumb and fore-finger, till it has penetrated through the coats of the vein; and at that inſtant to be raiſed a little upwards, in order to enlarge the orifice of the wound, which will give a freer paſſage to the blood. The moſt common and convenient ſize of an orifice is about twice the breadth of the back of an ordinary knife. You are to keep even between the two extremes of raſhneſs and timidity in making the puncture. For as in one caſe you will only divide the common integuments, and ſo leave your work undone; ſo in the other you will run the riſque of wounding the artery, nerve, or tendon.

Your aperture being thus made, and the inſtrument drawn inſtantly back, the blood will then ruſh forth from the oriſice either in a large or ſmall ſtream. In the mean time the blood muſt be permitted to flow as long as it ſhall be judged uſeful or neceſſary; and if it ſhould ſtop too ſoon, as it often may from too great a ſtricture of the bandage on the arm, it muſt be ſlackened a little, by which means the compreſſed artery being ſet at liberty, the blood will flow from the orifice as at firſt. If you find the orifice obſtructed by too great a tenſion of the ſkin, or an intruſion of the *membrana adipoſa*, you ought in that caſe to return the bit of fat, by preſſing with the finger or a warm ſponge, and to relax the ſkin by bending the arm a little. Laſtly, if the orifice be obſtructed by thick, grumous, or congealed blood, that impediment may be removed by wiping it with a ſponge dipt in warm water.

But that the patient's arm may not become painful or languid, by holding it long extended, the ſurgeon ſhould ſupport it by the cubitus for a little while; and then give him a ſtick, or other cylindric body, to turn round in his hand, that by the contractions of the flexor and extenſor muſcles of the fingers, the courſe of the blood may be accelerated towards the cubitus: which will ſtill be further promoted, if the patient urges a little voluntary cough.

When there ſeems to be a ſufficient quantity of blood diſcharged, the ligature muſt then be immediately taken off from above the elbow, and the ſkin about the orifice muſt next be gently ſtroked or preſſed together by the two fore-fingers of the left-hand; by which means the lips of the divided vein are more eaſily compreſſed and cloſed. But while the ſurgeon is doing this with his left hand, he takes the ſmalleſt of the two compreſſes, and applies it upon the inciſion with his right-hand: but ſo as to let what little blood may remain betwixt the orifice and the vein, be diſcharged, before he impoſes the compreſs. Over the firſt or ſmall compreſs he ſhould impoſe another that is a little larger, preſſing them both gently on the orifice with his left thumb, till the bandage is laid acroſs.

Having applied your bandage, and drawn down the patient's ſleeve over his arm; he ſhould be ordered not to uſe it too early or violently, before the orifice is well cloſed, which might excite a freſh hæmorrhage, an inflammation, ſuppuration, or other bad accident. And if the patient ſhould faint away ſoon after the operation, it may be then convenient to wet his noſtrils with Hungary water or vinegar; and to ſprinkle ſome of the laſt, or elſe cold water, in his face; and, eſpecially in ſummer-time, to let in the freſh and cool air, by opening the windows, *&c.* Alſo, if any wine or cordial water be at hand, you may give the languiſhing patient a ſmall draught thereof.

Of Bleeding *in the* Foot.

Bleeding in the foot is an operation of very old ſtanding: it having been an obſervation made by the moſt ancient phyſicians, that phlebotomy in this part proved highly ſerviceable in moſt diſorders of the head and breaſt, and for an obſtruction of the menſtrual and hæmorrhoidal flux; upon which diſcharges greatly depended the healthy ſtate of both ſexes. For theſe reaſons they therefore denominated thoſe veins of the foot, *Saphena* and *Cephalica:* the laſt of which extends itſelf from the internal ancle to the great toe; and the firſt, from the external *malleolus* to the ſmaller toes. But why one of them ſhould be thought or denominated more cephalic than the other, there is not the leaſt reaſon to be offered; ſince bleeding from either of them has altogether the very ſame effect. Therefore, the ſurgeon ſhould always open that which lies faireſt and moſt conſpicuous. But if the veins upon the *metatarſus*, or inſtep of the foot, do not well appear, it may then be convenient to open one of thoſe at the ancle, or about the calf or ham of the leg. Nor is the phlebotomiſt ſo liable to injure any of the tendons in theſe laſt parts as he is upon the *metatarſus*.

For the more eaſy and ſucceſsful apertion of theſe veins, the patient muſt firſt waſh both feet well for ſome time in hot water; that when the veins become ſufficiently turgid, the ſurgeon may take his choice of that which preſents faireſt either in the right or left foot, without paying any deference to the diſtinction of right or left in any of the forementioned diſorders. Having fixed upon the particular foot and vein, your ligature muſt be applied about two fingers breadth above the ancle; and then the patient muſt return it into the warm water, while the ſurgeon takes out and prepares his inſtrument or lancet. Then kneeling down on one knee, the ſurgeon takes out the patient's foot from the warm water, and having wiped it dry with a napkin, places it upon his other knee, or elſe upon a board laid over the veſſel of hot

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hot water. He now faſtens or ſecures down the vein from ſlipping with his left hand. But if the veins do not appear well under the ancles, the ligature muſt be removed higher, about two fingers breadth above where you intend to make the apertion of the vein which beſt offers itſelf.

The blood from the vein thus opened may be received into a baſon; and if it does not flow freely from the orifice, the foot ſhould be returned into the warm water, which will either prevent or diſſolve the congealing of the blood that in this caſe often obſtructs the aperture. When a ſufficient quantity of blood has been thus drawn, which may be known partly from the time, and partly from the largeneſs of the ſtream, as alſo from the redneſs of the water, and condition or ſtrength of the patient; the orifice is then to be cloſed by the finger, and after drying the foot with a napkin, to be ſecured by compreſſes and bandages.

Of Bleeding *in the Veins of the* Forehead, Temples, *and* Occiput.

There are many phyſicians and ſurgeons, who think that bleeding by the veins of the forehead and temples is much more ſerviceable and expeditious in relieving all diſorders of the head, ſuch as violent pains, vertigo, delirium, melancholy, and raving madneſs, *&c.* than the like diſcharge by veins more remote from the parts affected; judging that their vicinity renders them more capable of evacuating the offending matter of the diſeaſe. Before proceeding to cut the veins, an handkerchief or neckcloth ought to be drawn tight round the neck; that, by compreſſing the jugular vein, thoſe branches of it may become more turgid and conſpicuous. The vein being opened, the patient muſt hold down his head, that the blood may not trickle from his forehead into his eyes or mouth, when the ſtream does not ſpin out with ſufficient force. If the blood does not ſtop of itſelf after a due quantity is diſcharged, you muſt compreſs the orifice with your finger; and, after wiping the forehead and face, apply a compreſs or two, and then your bandage.

Bleeding from the occipital veins, which communicate with the lateral ſinuſſes of the *dura mater*, is both by reaſon and experience proved to be ſerviceable in moſt diſorders of the brain, where that part is overcharged with blood, which may be this way diverted and evacuated. The celebrated anatomiſt Morgagni eſpecially recommends it, with ſcarification and cupping in thoſe parts, for all lethargic diſorders.

Of Bleeding *in the* Jugular Veins *of the* Neck.

It has been a very ancient practice to bleed in the external jugular veins of the neck, for moſt inflammatory diſorders of the adjacent parts, for a quinſey, phrenzy, madneſs, ophthalmia, apoplexy, inveterate head-aches, lethargy, and other diſorders of the head. Nor are there wanting many among our modern ſurgeons and phyſicians to encourage the ſame practice, and that even from the authority of reaſon and experience; ſince the accumulated and obſtructed blood and humours may be this way diſcharged from the parts affected, and their bad conſequences prevented. Nor is the operation at all dangerous; ſince the jugular veins run on each ſide the neck from the head to the clavicles, immediately under the ſkin, and appearing generally very large, they may be eaſily perceived and opened: before which, you muſt make a ſtricture upon the lower part of the neck with a handkerchief, or the common ligature, which muſt be drawn tight by an aſſiſtant or the patient, to make the vein turgid and conſpicuous.

When the jugular veins have been by this means rendered turgid and conſpicuous, either of them which appears plaineſt may be ſecured by the finger for inciſion, either in the right or left ſide of the neck indifferently; when the diſorder lies in the whole head, or in the neck and fauces. But when only one ſide of the head, or one eye, is affected, the vein ought to be opened on the diſordered ſide of the neck. The requiſite quantity of the blood being taken, the ligature is next removed, and the orifice compreſſed with your finger, if the blood does not ſtop without, while you wipe clean the neck, and then apply your compreſs and circular bandage. Thus the blood ſtops without any danger of a freſh hæmorrhage. Laſtly, it muſt be acknowledged, that the patient faints away as readily after bleeding in the neck, as the jugular veins are ſafely and eaſily opened: but no danger follows from thence.

Of Bleeding *in the* Veins, *called* Ranulæ, *under the Tongue.*

It is very often found of no ſmall ſervice in a quinſey, or other inflammatory diſorder of the neck, to bleed in the two ſmall veins which run under the tip or end of the tongue: eſpecially if a larger vein has been opened before, either in the neck, foot, or arm, whereby the inſpiſſated and ſtagnated blood may be gradually evacuated. To bleed in theſe veins, a ſtricture being made upon the neck as before, you then elevate the *apex* of the tongue with your left hand, while, with the lancet in your right, you circumſpectly open firſt one, and then the other on each ſide; becauſe the apertion of one only will hardly ever diſcharge blood enough to give any conſiderable relief. When you judge a ſufficient quantity of blood has run out of the mouth into your veſſel, remove the ligature from the neck: upon which the flux uſually ſtops of itſelf. But if it ſhould ſtill continue, let the patient take a little vinegar or *Frontiniac* wine in his mouth: or elſe you may apply a bit of vitriol or allum, or a compreſs dipt in ſome ſtyptic liquor, till the hæmorrhage ceaſes; which can never be dangerous even without ſuch topics.

Of Phlebotomy *in the* Penis.

Bleeding in the *vena dorſalis penis* uſually ſurpaſſes the benefit of all remedies whatever in abating inflammatory diſorders of this member. This large vein, which runs along the back or upper ſide of the *penis*, being generally pretty much diſtended, and conſpicuous in an inflammation of this part, may be inciſed about the middle or back part of the penis; and kept bleeding till the member becomes flaccid, and a ſufficient quantity of blood be diſcharged proportionable to the urgency of the ſymptoms. This done, you muſt apply a compreſs, and the bandage proper for the penis. But you muſt carefully endeavour to avoid injuring the arteries or nerves which enter the penis near this vein; as alſo not to make your bandage too ſtrict: for by theſe means the inflammation and ſymptoms may turn out worſe than before.

Of Wounds.

To conceive rightly of the nature and treatment of wounds, under the variety of diſorders that they are ſubject to, it will be proper firſt to learn, what are the appearances in

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the progreſs of healing a large wound, when it is made with a ſharp inſtrument, and the conſtitution is pure.

In this circumſtance, the blood-veſſels, immediately upon their diviſion, bleed freely, and continue bleeding till they are either ſtopped by art, or at length contracting and withdrawing themſelves into the wound, their extremities are ſhut up by the coagulated blood. The hæmorrhage being ſtopped, the next occurrence, in about twenty-four hours, is a thin ſerous diſcharge; and, a day or two after, an increaſe of it, though ſomewhat thickened, and ſtinking. In this ſtate it continues two or three days without any great alteration, from which time the matter grows thicker and leſs offenſive; and when the bottom of the wound fills up with little granulations of fleſh, it diminiſhes in its quantity, and continues doing ſo till the wound is quite ſkinned over.

The firſt ſtage of healing, or the diſcharge of matter, is by ſurgeons called *digeſtion*; the ſecond, or the filling up with fleſh, *incarnation*; and the laſt, or ſkinning over, *cicatrization*.

It is worth obſerving, that the loſs of any particular part of the body can only be repaired by the fluids of that diſtinct part; and as, in a broken bone, the *callus* is generated from the ends of the fracture, ſo, in a wound, is the cicatrix from the circumference of the ſkin only: Hence ariſes the neceſſity of keeping the ſurface even, either by preſſure or eating medicines, that the eminence of the fleſh may not reſiſt the fibres of the ſkin in their tendency to cover the wound. This eminence is compoſed of little points or granulations called *fungus*, or proud fleſh, and is frequently eſteemed an evil, though in truth this ſpecies of it be the conſtant attendant on healing wounds; for when they are ſmooth, and have no diſpoſition to ſhoot out above their lips, there is a ſlackneſs to heal, and a cure is very difficultly effected. Since then a *fungus* prevents healing only by its luxuriancy, and all wounds cicatriſe from their circumference, there will be no occaſion to deſtroy the whole *fungus* every time it riſes, but only the edges of it near the lips of the ſkin; which may be done by gentle eſcharotics, ſuch as lint dipt in a mild ſolution of *vitriol*, or for the moſt part only by dry lint, and a tight bandage, which will reduce it ſufficiently to a level, if applied before the *fungus* have acquired too much growth. In large wounds, the application of corroſive medicines to the whole ſurface, is of no uſe; becauſe the *fungus* will attain but to a certain height, when left to itſelf, which it will be frequently riſing up to, though it be often waſted; and as all the advantage to be gathered from it, is only from the evenneſs of its margin, the purpoſe will be as fully anſwered by keeping that under only, and an infinite deal of pain avoided from the continual repetition of eſcharotics.

From what has been ſaid of the progreſs of a wound made by a ſharp inſtrument, where there is no indiſpoſition of body, we ſee the cure is performed without any interruption, but from the *fungus*; ſo that the buſineſs of ſurgery will conſiſt principally in a proper regard to that point, and in applications that will the leaſt interfere with the ordinary courſe of nature, which in theſe caſes will be ſuch as act the leaſt upon the ſurface of the wound; and agreeably to this we find, that dry lint only is generally the beſt remedy through the whole courſe of dreſſing: at firſt, it ſtops the blood with leſs injury than any ſtyptick powders or waters; and afterwards, by abſorbing the matter, which in the beginning of ſuppuration is thin and acrimonious, it becomes in effect a digeſtive: during incarnation it is the ſofteſt medium that can be applied between the roller and tender granulations, and at the ſame time is an eaſy compreſs upon the ſprouting *fungus*.

Over the dry lint, may be applied a pledgit of ſome ſoft ointment ſpread upon tow, which muſt be renewed every day, and preſerved in its ſituation by a gentle bandage; though in all large wounds, the firſt dreſſing, after that of the accident or operation, ſhould not be applied in leſs than three days, when, the matter being formed, the lint ſeparates more eaſily from the part; in the removal of which, no force ſhould be uſed, but only ſo much be taken away as is looſe and comes off without pain.

Of Inflammations *and* Abscesses.

As almoſt all abſceſſes are the conſequences of inflammations, and theſe produce a variety of events, as they are differently complicated with other diſorders, it will be proper firſt to make ſome inquiry into their diſpoſition. Inflammations from all cauſes have three ways of terminating; either by diſperſion, ſuppuration, or gangrene.

But though every kind of inflammation will ſometimes terminate in different ſhapes, yet a probable conjecture of the event may be always gathered from the ſtate of the patient's health. Thus inflammations happening in a ſlight degree upon colds, and, without any foregoing indiſpoſition, will moſt probably be diſperſed: thoſe which follow cloſe upon a fever, or happen to a very groſs habit of body, will generally impoſthumate: and thoſe which fall upon very old people, or dropſical conſtitutions, will have a ſtrong tendency to gangrene.

If the ſtate of an inflammation be ſuch, as to make the diſperſion of it ſafely practicable, that end will be beſt brought about by evacuations, ſuch as plentiful bleeding and repeated purges: the part itſelf muſt be treated with fomentations twice a-day; and if the ſkin be very tenſe, it may be embrocated with a mixture of three fourths of oil of roſes, and one fourth of common vinegar, and afterwards be covered with *unguent. flor. ſamb.* or a ſoft ointment made of white wax and ſweet oil, ſpread upon a fine rag, and rolled on gently. If after four or five days, the inflammation begin to ſubſide, the purging-waters and manna may take place of other purges, and the embrocation of oil and vinegar be now omitted, or ſooner, if it has begun to excoriate. The ointment of wax and oil may be continued to the laſt. During the cure a thin diet is abſolutely neceſſary, and in the height of the inflammation the drinking of thin liquors is of great ſervice.

Here we have ſuppoſed that the inflammation had ſo great a tendency to diſcuſſion, as, by the help of proper aſſiſtance, to terminate in that manner; but when it happens that the diſpoſition of the tumour reſiſts all diſcutient means, we muſt then deſiſt from any farther evacuations, and aſſiſt nature in the bringing on a ſuppuration.

That matter will moſt likely be formed, we may judge from the increaſe of the ſymptomatic fever, and enlargement of the tumour, with more pain and pulſation; and if a ſmall rigor come on, it is hardly to be doubted. Inflammations after a fever, and the ſmall-pox, almoſt always ſuppurate; but theſe preſently diſcover their tendency, or at leaſt ſhould be at firſt gently treated, as though we expected an impoſthumation. It is a maxim laid down in ſur-

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gery, that evacuations are pernicious in every circumſtance of a diſeaſe, which is at laſt to end in ſuppuration: But as phyſicians do now acknowledge, that bleeding on certain occaſions in the ſmall-pox, is not only no impediment to the maturation, but even promotes it; ſo in the formation of abſceſſes, when the veſſels have been clogged, and the ſuppuration has not kindly advanced, bleeding has ſometimes quickened it accordingly; but, however, this practice is to be followed with caution. Purges are, no doubt, improper at this time; yet if the patient be coſtive, he muſt be aſſiſted with gentle clyſters every two or three days.

Of all the applications invented to promote ſuppuration, there are none ſo eaſy as poultices; but as there are particular tumours very ſlow of ſuppuration, and almoſt void of pain (ſuch, for inſtance, are ſome of the ſcrophulous ſwellings) it will be leſs troubleſome in theſe caſes to wear the gum-plaſters, which may be renewed every four or five days only. Amongſt the ſuppurative poultices, perhaps there is none preferable to that made of bread and milk ſoftened with oil; at leaſt the advantage of any other over it is not to be diſtinguiſhed in practice. The abſceſs may be covered with the poultice twice a-day, till it come to that ripeneſs as to require opening, which will be known by the thinneſs and eminence of the ſkin in ſome part of it, a fluctuation of the matter, and, generally ſpeaking, an abatement of the pain previous to theſe appearances.

The ſigns of a gangrene are theſe: the inflammation loſes its redneſs, and becomes duſkiſh and livid; the tenſeneſs of the ſkin goes off, and feels to the touch flabby or emphyſematous; veſications filled with ichor of different colours ſpread all over it; the tumour ſubſides, and, from a duſkiſh complexion, turns black; the pulſe quickens and ſinks, and profuſe ſweats coming on, at laſt grow cold, and the patient dies.

To ſtop the progreſs of a mortification, the method of treatment will be nearly the ſame, from whatever cauſe it proceed, except in that ariſing from cold; in which caſe, we ought to be cautious not to apply warmth too ſuddenly to the part, if it be true, that in the northern countries they have daily conviction of gangrenes produced by this means, which might have been eaſily prevented by avoiding heat; nay, they carry their apprehenſion of the danger of ſudden warmth ſo far as to cover the part with ſnow firſt, which they ſay ſeldom fails to obviate any ill conſequence.

The practice of ſcarifying gangrenes, by ſeveral inciſions, is almoſt univerſal: and with reaſon; ſince it not only ſets the parts free, and diſcharges a pernicious ichor, but makes way for whatever efficacy there may be in topical applications. Theſe are different with different ſurgeons: but the digeſtives ſoftened with oil of turpentine are as good dreſſings as any for the ſcarifications; and upon them all over the part, may be laid the *theriaca Londinenſis*, which ſhould be always uſed in the beginning of a gangrene, before the neceſſity of ſcarifying ariſes; or what is equally good, if not often preferable, a cataplaſm made with lixivium and bran, and applied warm, which will retain its heat better than moſt other topicals. Medicines alſo given internally are beneficial, and theſe ſhould conſiſt of the cordial kind; but the bark is the ſovereign remedy for this diſorder: after the ſeparation of the eſchar, the wound becomes a common ulcer, and muſt be treated as ſuch.

There are two ways of opening an abſceſs; either by inciſion, or cauſtick; but inciſion is preferable in moſt caſes. In ſmall abſceſſes, there is ſeldom a neceſſity for greater dilatation than a little orifice made with the point of a lancet; and in large ones, where there is not a great quantity of ſkin diſcoloured and become thin, an inciſion to their utmoſt extent will uſually anſwer the purpoſe; or if there be much thin diſcoloured ſkin, a circular or oval piece of it muſt be cut away; which operation, if done dexterouſly with a knife, is much leſs painful than by cauſtick, and at once lays open a great ſpace of the abſceſs, which may be dreſſed down to the bottom, and the matter of it be freely diſcharged; whereas, after a cauſtick, though we make inciſions through the eſchar, yet the matter will be under ſome confinement; and we cannot have the advantage of dreſſing properly till the ſeparation of the ſlough, which often requires a conſiderable time, ſo that the cure muſt be neceſſarily delayed; beſides that the pain of burning continuing two or three hours, which a cauſtick uſually requires in doing its office, draws ſuch a fluction upon the ſkin round the eſchar, as ſometimes to indiſpoſe it very much for healing afterwards. In the uſe of cauſticks, it is but too much a practice, to lay a ſmall one on the moſt prominent part of a large tumour, which not giving ſufficient vent to the matter, and perhaps the orifice ſoon after growing narrow, leads on to the neceſſity of employing tents; which two circumſtances more frequently make fiſtulas after an abſceſs, than any malignity in the nature of the abſceſs itſelf. The event would more certainly be the ſame after a ſmall inciſion; but ſurgeons not depending ſo much on ſmall openings by inciſion, as by cauſtick, do, when they uſe the knife, generally dilate ſufficiently: whereas, in the other way, a little opening in the moſt depending part of the tumour uſually ſatisfies them.

From this account of the method of opening abſceſſes, it does not appear often neceſſary to apply cauſticks; yet they have their advantages in ſome reſpects, and are ſeldom ſo terrible to patients as the knife, though in fact they are frequently more painful to bear. They are of moſt uſe in caſes where the ſkin is thin and inflamed: and we have reaſon to think the malignity of the abſceſs is of that nature as to prevent a quickneſs of incarning; in which circumſtance, if an inciſion only were made through the ſkin, little ſinuſes would often form, and burrow underneath, and the lips of it lying looſe and flabby, would become callous, and retard the cure, though the malignity of the wound were corrected: of this kind, are venereal buboes, which notwithſtanding they often do well by mere inciſion, yet when the ſkin is in the ſtate we have ſuppoſed, the cauſtick is always preferable: but this method ſhould be confined to venereal buboes; for thoſe which follow a fever, or the ſmall-pox, for the moſt part are curable by inciſion only. There are many ſcrophulous tumours, where the reaſoning is the ſame as in the venereal; and even in great ſwellings, if the patient will not ſubmit to cutting, and the ſurgeon is apprehenſive of any danger in wounding a large veſſel, which is often done with the knife, yet as this inconvenience is avoided by cauſtick, it may on ſuch an occaſion be made uſe of; however, in ſcrophulous ſwellings of the neck and face, unleſs they are very large, cauſticks are not adviſeable, ſince in that part of the body, with length of time, they heal after inciſion. Cauſticks are of great ſervice in deſtroying ſtubborn ſcrophulous indurations of the glands, alſo venereal indurations of the glands of the groin, which will neither diſcuſs nor ſuppurate; likewiſe in expoſing carious bones, and making;

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making large iſſues. The beſt cauſtick in uſe is a paſte made with lime and *lixivium capitale*, which is to be prevented from ſpreading, by cutting an orifice in a piece of ſticking plaiſter, nearly as big as you mean to make the eſchar; which being applied to the part, the cauſtick muſt be laid on the orifice, and preſerved in its ſituation by a few ſlips of plaiſter laid round its edges, and a large piece over the whole. When iſſues are made, or bones expoſed, the eſchar ſhould be cut out immediately, or the next day: for if we wait the ſeparation, we miſcarry in our deſign of making a deep opening; ſince ſloughs are flung off by the ſprouting new fleſh underneath, which fills up the cavity at the ſame time that it diſcharges the eſchar; ſo that we are obliged afterwards to make the opening a ſecond time with painful eſcharotick medicines. To make an iſſue, or lay a bone bare, this cauſtick may lie on about four hours; to deſtroy a large gland, five or ſix; and to open abſceſſes, an hour and a half, two hours, or three hours, according to the thickneſs of the ſkin; and what is very remarkable, notwithſtanding its ſtrength and ſudden efficacy, it frequently gives no pain where the ſkin is not inflamed, as in making iſſues, and opening ſome few abſceſſes.

When an abſceſs is already burſt, we are to be guided by the probe where to dilate, obſerving the ſame rules with regard to the degree of dilatation as in the other caſe. The uſual method of dilating, is with the probe-ſciſſars; and indeed, in all abſceſſes, the generality of ſurgeons uſe the ſciſſars, after having firſt made a puncture with a lancet: but as the knife operates much more quickly, and with leſs violence to the parts, than ſciſſars, which ſqueeze at the ſame time that they wound, it will be ſparing the patient a great deal of pain to uſe the knife, where-ever it is practicable, which is in almoſt all caſes, except ſome fiſtula's *in ano*, where the ſciſſars are more convenient. The manner of opening with a knife, is by ſliding it on a director, the groove of which prevents its being miſguided. If the orifice of the abſceſs be ſo ſmall as not to admit the director, or the blade of the ſciſſars, it muſt be enlarged by a piece of ſponge-tent; which is made by dipping a dry bit of ſponge in melted wax, and immediately ſqueezing as much out of it again as poſſible, between two pieces of tile or marble; the effect of which is, that the looſe ſponge being compreſſed into a ſmall compaſs, if any of it be introduced into an abſceſs, the heat of the part melts down the remaining wax that holds it together, and the ſponge ſucking up the moiſture of the abſceſs, expands, and in expanding opens the orifice wider, and by degrees, ſo as to give very little pain.

The uſual method of dreſſing an abſceſs, the firſt time, is with dry lint only; or if there be no flux of blood, with ſoft digeſtives ſpread on lint. If there be no danger of the upper part of the wound reuniting too ſoon, the doſſils muſt be laid in looſe; but if the abſceſs be deep, and the wound narrow, as is the caſe ſometimes of abſceſſes *in ano*, the lint muſt be crammed in pretty tightly, that we may have afterwards the advantage of dreſſing down to the bottom without the uſe of tents, which, by reſiſting the growth of the little granulations of fleſh, in proceſs of time harden them, and in that manner produce a fiſtula; ſo that, inſtead of being uſed for the cure of an abſceſs, they never ſhould be employed but where we mean to retard the healing of the external wound, except in ſome little narrow abſceſſes, where, if they be not crammed in too large, they become as doſſils, admitting of incarnation at the bottom; but care ſhould be taken, not to inſinuate them much deeper than the ſkin in this caſe, and that they ſhould be repeated twice a day, to give vent to the matter they confine. But tents do moſt good in little deep abſceſſes, whence any extraneous body is to be evacuated, ſuch as ſmall ſplinters of bone, *&c.*

The uſe of vulnerary injections into abſceſſes has been thought to bear ſo near a reſemblance to the uſe of tents, that they both fell into diſrepute almoſt at the ſame time.

Over the doſſils of lint may be laid a large pledgit of tow ſpread with baſilicon, which will lie ſofter than a defenſative plaiſter; for this, though deſigned to defend the circumference of wounds againſt inflammation or a fluction of humours, is often the very cauſe of them; ſo that the dreſſings of large wounds ſhould never be kept on by theſe plaiſters, where there is danger of ſuch accidents. In this manner, the dreſſings may be continued, till the cavity is incarned; and then it may be cicatriſed with dry lint, or ſome of the cicatriſing ointments, obſerving to keep the *fungus* down, as directed before.

In the courſe of dreſſing it will be proper to have regard to the ſituation of the abſceſs, and as much as poſſible to make the patient favour the diſcharge by his ordinary poſture: and to this end alſo, as what is of greater importance than the virtue of any ointment, the diſcharge muſt be aſſiſted by compreſs and bandage: the compreſs may be made of rags or plaiſter; though the latter is ſometimes preferable, as it remains immoveable on the part it is applied to. The frequency of dreſſing will depend on the quantity of diſcharge: once in twenty-four hours is ordinarily ſufficient; but ſometimes twice, or perhaps three times, is neceſſary.

Of Ulcers.

When a wound or abſceſs degenerates into ſo bad a ſtate as to reſiſt the methods of cure above laid down, and loſes that complection which belongs to a healing wound, it is called an ulcer; and as the name is generally borrowed from the ill habit of the ſore, it is a cuſtom to apply it to all ſores that have any degree of malignity, though they be immediately formed without any previous abſceſs or wound; ſuch are the venereal ulcers of the tonſils, *&c.*

Ulcers are diſtingniſhed by their particular diſorders, though it ſeldom happens that the affections are not complicated; and when we lay down rules for the management of one ſpecies of ulcer, it is generally requiſite to apply them to almoſt all others. However, the characters of moſt eminence are, the callous ulcer, the ſinous ulcer, and the ulcer with caries of the adjacent bone; tho' there be abundance more known to ſurgeons, ſuch as the putrid, the corroſive, the varicous, *&c.* but as they have acquired their names from ſome particular affection, we ſhall ſpeak of the treatment of them under the general head of ulcers.

It will be often in vain to purſue the beſt means of cure by topical application, unleſs we are aſſiſted by internal remedies; for as many ulcers are the effects of a particular indiſpoſition of body, it will be dimcult to bring them into order, while the cauſe of them remains with any violence; though they are ſometimes in a great degree the diſcharge of the indiſpoſition itſelf, as in the plague, ſmall-pox, *&c.* But we ſee it generally neceſſary in the pox, the ſcurvy, obſtructions of the menſes dropſies, and many other diſtempers, to give internals of great efficacy; and indeed, there are hardly any conſtitutions where ulcers are not aſſiſted by ſome phyſical regimen. Thoſe that are cancerous and

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and ſcrophulous ſeem to gain the leaſt advantage from phyſic; for if in their beginnings they have ſometimes been very much relieved, or cured, by ſalivation, or any other evacuation, they are alſo often irritated and made worſe by them; ſo that there is nothing very certain in the effects of violent medicines in theſe diſtempers. Upon the whole, in both theſe caſes, the milk-diet, and gentle purgings with manna, and the waters, ſeem to be moſt efficacious; though briſk methods may be uſed with more ſafety in the evil than in the cancer; and ſometimes, particularly in young ſubjects, the decoction of the woods is extremely beneficial for ſcrophulous ulcers: but it has lately been atteſted by men of great ſkill and veracity, that ſea-water is more powerful than any other remedy hitherto known, both for ſcrophulous ulcers, and ſcrophulous tumours.

When an ulcer becomes foul, and diſcharges a naſty thin ichor, the edges of it, in proceſs of time, tuck in, and growing skinned and hard, give it the name of a callous ulcer, which, ſo long as the edges continue in that ſtate, muſt neceſſarily be prevented from healing: But we are not immediately to deſtroy the lips of it, in expectation of a ſudden cure; for while the malignity of the ulcer remains, which was the occaſion of the calloſity, ſo long will the new lips be ſubject to a relapſe of the ſame kind, however often the external ſurface of them be deſtroyed: ſo that when we have to deal with this circumſtance, we are to endeavour to bring the body of the ulcer into a diſpoſition to recover by other methods. It ſometimes happens to poor laborious people, who have not been able to afford themſelves reſt, that lying a-bed will in a ſhort time give a diverſion to the humours of the part, and the callous edges ſoftening, will without any great aſſiſtance ſhoot out a cicatrix, when the ulcer is grown clean and filled with good fleſh: the effect of a ſalivation is generally the ſame; and even an iſſue does ſometimes diſpoſe a neighbouring ulcer to heal: but though calloſities be frequently ſoftened by theſe means, yet when the ſurface of the ulcer begins to yield thick matter, and little granulations of red fleſh ſhoot up, it will be proper to quicken nature by deſtroying the edges of it, if they remain hard. The manner of doing this, is by touching them a few days with the lunar cauſtick, or *lapis infernalis*; and ſome chuſe to cut them off with a knife: but this laſt method is very painful, and not more efficacious; though when the lips do not tuck down cloſe to the ulcer, but hang looſe over it, as in ſome venereal buboes, where the matter lies a great way under the edges of the ſkin, the eaſieſt method is cutting them off with the ſciſſars.

To digeſt the ulcer, or to procure good matter from it when in a putrid ſtate, there are an infinity of ointments invented; but the *Baſilicon Flavum* alone, or ſoftened down ſometimes with turpentines, and ſometimes mixt up with different proportions of red precipitate, ſeems to ſerve the purpoſes of bringing an ulcer on to cicatriſation as well as any of the others. When the ulcer is incarned, the cure may be finiſhed as in other wounds; or if it do not cicatriſe kindly, it may be waſhed with *Aq. Calcis*, or *Aq. Phag.* or dreſſed with a pledgit dipt in *Tinct. Myrrhæ:* and if excoriations are ſpread round the ulcer, they may be anointed with *Sperm. Cet.* ointment, or *Unguent. Nutritum.*

The *Red Precipitate* has of late years acquired the credit it deſerves for the cure of ulcers; but by falling into general uſe, is very often unſkilfully applied: when mixed with the, *Baſilicon*, or, what is neater, a cerate of wax and oil, it is moſt certainly a digeſtive, ſince it hardly ever fails to make the ulcer yield a thick matter in twenty-four hours, which diſcharged a thin one before the application of it.

If the ulcer ſhould be of ſuch a nature as to produce a ſpongy fleſh, ſprouting very high above the ſurface, it will be neceſſary to deſtroy it by ſome of the eſcharoticks, or the knife. This fungus differs very much from that belonging to healing wounds, being more eminent and lax, and generally in one maſs; whereas the other is in little diſtinct protuberances. It approaches often towards a cancerous complexion, and when it riſes upon ſome glands does actually degenerate ſometimes into a cancer. When theſe excreſcences have ariſen in venereal ulcers, eſcharoticks ſhould be applied. Thoſe in uſe, are the *Vitriol*, the *Lunar Cauſtick*, the *Lapis Infernalis*, and more generally the red *Precipitate* powder.

It is but ſeldom, that theſe inveterate fungules appear on an ulcer; but it is very uſual for thoſe of a milder kind to riſe, which may often be made to ſubſide with preſſure, and the uſe of mild eſcharoticks: however, if the aſpect of the ſore be white and ſmooth, as happens in ulcers accompanied with a dropſy, and often in young women with obſtructions, it will anſwer no purpoſe to waſte the excreſcences, until the conſtitution is repaired, when moſt probably they will ſink without any aſſiſtance. In ulcers alſo, where the ſubjacent bone is carious, great quantities of looſe flabby fleſh will grow up above the level of the ſkin: but as the caries is the cauſe of the diſorder, it will be in vain to expect a cure of the excreſcence, until the rotten part of the bone be removed; and every attempt with eſcharoticks will be only a repetition of pain to the patient without any advantage.

When the excreſcence is cancerous, and does not riſe from a large cancer, but only from the ſkin itſelf, it has been uſual to recommend the actual cautery; but it is better to cut away quite underneath, and dreſs afterwards with eaſy applications. As to the treatment of incurable cancerous ulcerations, after much trial, ſurgeons have at laſt diſcovered, that what gives the moſt eaſe to the ſore is the moſt ſuitable application; and therefore the uſe of eſcharoticks is not to be admitted on any pretence whatſoever; nor in thoſe parts of a cancer that are corroded into cavities, muſt the precipitate be made uſe of to procure digeſtion, or promote the ſeparation of the ſloughs. The beſt way, therefore, is to be guided by the patient what medicine to continue. Thoſe uſually preſcribed are preparations from lead; but what we have found moſt beneficial, have been ſometimes dry lint alone when it does not ſtick to the cancer; at other times, lint doſſils ſpread with *Baſilicon* or *Cerat. de Lapid. Calam.* and oftener than either with a *Cerate* made of oil and wax, or the *Sperm. Cet.* ointment; and over all, a pledgit of tow ſpread with the ſame. Embrocating the neighbouring ſkin and edges of it with milk, is of ſervice; but the chief good is to be acquired by diet, which ſhould be altogether of milk and things made of milk, though herbage may be admitted alſo. Iſſues in the ſhoulders or thighs do alſo alleviate the ſymptoms; and manna, with the purging waters, once, or perhaps twice a-week, will ſerve to keep the body cool.

When ulcers or abſceſſes are accompanied with inflammation and pain, they are to be aſſiſted with fomentations made of ſome of the dry herbs, ſuch as Roman wormwood, bay-leaves, and roſemary; and when they are very putrid and corroſive, which circumſtances give them the name of foul phagædenick ulcers, ſome ſpirits of wine ſhould be added to the fomentation, and the bandage be alſo dipt in brandy

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or ſpirits of wine, obſerving in theſe caſes where there is mu h pain, always to apply gentle medicines till it be removed.

When the pain and inflammation are exceſſive, bleeding and other evacuations will often be ſerviceable; and above all things, reſt and a horizontal poſition, which laſt circumſtance is of ſo great importance to the cure of ulcers of the legs, that unleſs the patient will conform to it ſtrictly, the ſkill of the ſurgeon will often avail nothing; for as the indiſpoſition of theſe ſores is in ſome meaſure owing to the gravitation of the humours downwards, it will be much more beneficial to lie along than ſit upright, though the leg be laid on a chair; ſince even in this poſture they will deſcend with more force, than if the body was reclined.

In ulcers of the legs, accompanied with varices or dilatations of the veins, the method of treatment will depend upon the other circumſtances of the ſore; for the varix can only be aſſiſted by the application of bandage, which muſt be continued a conſiderable time after the cure. The neateſt bandage is the ſtrait ſtocking, which is particularly ſerviceable in this caſe; though alſo, if the legs be œdematous, or if, after the healing of the ulcers, they ſwell when the patient quits his bed, it may be worn with ſafety and advantage. There are inſtances of one vein only being varicous, which when it happens, may be deſtroyed by tying it above and below the dilation, as in an aneuriſm; but this operation ſhould only be practiſed where the varix is large and painful.

Ulcers of many years ſtanding are very difficult of cure; and in old people the cure is often dangerous, frequently exciting an aſthma, a diarrhœa, or a fever, which deſtroys the patient, unleſs the ſore break out again; ſo that it is not altogether adviſeable to attempt the abſolute cure in ſuch caſes, but only the reduction of them into better order, and leſs compaſs, which, if they be not malignant, is generally done with reſt and proper care. The cure of thoſe in young people may be undertaken with more ſafety; but we often find it neceſſary to raiſe a ſalivation to effect it, though, when completed it, does not always laſt; ſo that the proſpect of cure in ſtubborn old ulcers, at any time of life, is but indifferent. In all theſe caſes, however, it is proper to purge once or twice a-week with calomel, if the patient can bear it, and to make an iſſue when the ſore is almoſt healed, in order to continue a diſcarge the conſtitution has been ſo long habituated to, and prevent its falling from the cicatrix, and burſting out again in that place.

When an ulcer or abſceſs has any ſinuſes or channels opening and diſcharging themſelves into the ſore, they are called ſinous ulcers. Theſe ſinuſes, if they continue to drain a great while, grow hard in the ſurface of their cavity, and then are termed fiſtulæ, and the ulcer a fiſtulous ulcer; alſo, if matter be diſcharged from any cavity, as thoſe of the joints, abdomen, &c. the opening is called a ſinous ulcer, or a fiſtula.

The treatment of theſe ulcers depends upon a variety of circumſtances. If the matter of the ſinus be thick, ſtrict bandage and compreſs will ſometimes bring the oppoſite ſides of the ſinus to a re-union: if the ſinus grow turgid in any part, and the ſkin thinner, ſhewing a diſpoſition to break, the matter muſt be made to puſh more againſt that part, by plugging it up with a tent; and then a counter opening muſt be made, which proves often ſufficient for the whole abſceſs, if it be not afterwards too much tented, which locks up the matter and prevents the healing; or too little, which will have the ſame effect; for dreſſing quite ſuperficially, does ſometimes prove as miſchievous as tents, and for nearly the ſame reaſon, ſince ſuffering the external wound to contract into a narrow orifice before the internal one be incarned, does almoſt as effectually lock up the matter as a tent: to preſerve then a medium in theſe caſes, a hollow tent of lead or ſilver may be kept in the orifice, which, at the ſame time that it keeps it open, gives vent to the matter. The abſceſſes where the counter opening are made moſt frequently, are thoſe of compound fractures, and the breaſt; but the latter do oftner well without dilatation than the former, though it muſt be performed in both, if practicable, the whole length of the abſceſs, when after ſome trial the matter does not leſſen in quantity, and the ſides of it grow thinner; and if the ſinuſes be fiſtulous, there is no expectation of cure without dilation. There are alſo a great many ſcrophulous abſceſſes of the neck, that ſometimes communicate by ſinuſes running under large indurations; in which inſtances, counter-openings are adviſeable, and generally anſwer without the neceſſity of dilating the whole length; and indeed there are few abſceſſes in this diſtemper, which ſhould be opened beyond the thinneſs of the ſkin. When abſceſſes of the joints diſcharge themſelves, there is no other method of treating the fiſtula, but by keeping it open with the cautions already laid down, till the cartilages of the extremities of the bones being corroded, the two bones ſhoot into one another, and form an anchyloſis of the joint, which is the moſt uſual cure of ulcers in that part.

Gun-ſhot wounds often become ſinuous ulcers, and then are to be conſidered in the ſame light as thoſe already deſcribed; though ſurgeons have been always inclined to conceive there is ſomething more myſterious in theſe wounds than any others: but their terribleneſs is owing to the violent contuſion and laceration of the parts, and often to the admiſſion of extraneous bodies into them, as the bullet, ſplinters, clothes, &c. and were any other force to do the ſame thing, the effect would be exactly the ſame as when done by fire-arms. The treatment of theſe wounds conſiſts in removing the extraneous body as ſoon as poſſible; to which end the patient muſt be put into the ſame poſture as when he received the wound: if it cannot be extracted by cutting upon it, which ſhould always be practiſed when the ſituation of the blood-veſſels, &c. does not forbid, it muſt be left to nature to work out, and the wound dreſſed ſuperficially; for we muſt not expect, that if it be kept open with tents, the bullet, &c. will return that way; and there is hardly any caſe where tents are more pernicious than here, becauſe of the violent tenſion and diſpoſition to gangrene which preſently enſue. To guard againſt mortification in this, and all other violently contuſed wounds, it will be proper to bleed the patient immediately, and ſoon after give a clyſter; the part ſhould be dreſſed with ſoft digeſtives, and the compreſs and roller applied very looſe, being firſt dipt in brandy or ſpirits of wine. The next time the wound is opened, if it be dangerous, the ſpirituous fomentation may be employed, and after that continued till the danger is over. If a mortification comes on, the applications for that diſorder muſt be uſed. In gun-ſhot wounds, it ſeldom happens that there is any effuſion of blood, unleſs a large veſſel be torn; but the bullet makes an eſchar, which uſually ſeparates in a few days, and is followed with a plentiful diſcharge; but when the wound is come

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come to this period, it is manageable by the rules already laid down.

When an ulcer with looſe rotten fleſh diſcharges more than the ſize of it ſhould yield, and the diſcharge is oily and ſtinking, in all probability the bone is carious; which may eaſily be diſtinguiſhed by running the probe through the fleſh: and if ſo, it is called a carious ulcer. The cure of theſe ulcers depends principally upon the removal of the rotten part of the bone, without which it will be impoſſible to heal, as we ſee ſometimes even in little ſores of the lower jaw, which taking their riſe from a rotten tooth, will not admit of cure till the tooth be drawn. Thoſe caries which happen from the matter of abſceſſes lying too long upon the bone, are moſt likely to recover: thoſe of the pox very often do well, becauſe that diſtemper fixes ordinarily upon the middle and outſide of the denſeſt bones, which admit of exfoliation; but thoſe produced by the evil, where the whole extremities of ſpongy parts of the bone are affected, are exceedingly dangerous, though all enlarged bones be not neceſſarily carious; and there are ulcers ſometimes on the ſkin that covers them, which do not communicate with the bone, and conſequently do well without exfoliation: nay, it ſometimes happens, though the caſe be rare, that, in young ſubjects particularly, the bones will be carious to ſuch a degree, as to admit a probe almoſt thro' the whole ſubſtance of them, and yet afterwards admit of a cure, without any notable exfoliation.

The method of treating an ulcer with a caries, is by applying a cauſtick of the ſize of the ſcale of the bone that is to be exfoliated, and after having laid it bare, to wait till ſuch time as the carious part can, without violence, be ſeparated, and then heal the wound. In order to quicken the exfoliation, there have been ſeveral applications deviſed; but that which has been moſt uſed in all ages, is the actual cautery, with which ſurgeons burn the naked bone every day, or every other day, to dry up, as they ſay, the moiſture, and by that means procure the ſeparation: but as this practice is never of great ſervice, and always cruel and painful it is now pretty much exploded Indeed, from conſidering the appearance of a wound, when a ſcale of bone is taken out of it, there is hardly any queſtion to be made, but that burning retards rather than haſtens the ſeparation; for as every ſcale of a carious bone is flung off by new fleſh generated between it and the ſound bone, whatever would prevent the growth of theſe granulations, would alſo in a degree prevent the exfoliation; which muſt certainly be the effect of a red hot iron applied ſo cloſe to it; though the circumſtances of carious bones, and their diſpoſition to ſeparate, are ſo different from one another, that it is hardly to be gathered from experience, whether they will ſooner exfoliate with or without the aſſiſtance of fire, for ſometimes, in both methods, an exfoliation is not procured in a twelve month, and at other times it happens in three weeks or a month: however, if it be only uncertain whether the actual cautery be beneficial or not, the cruelty that attends the uſe of it ſhould entirely baniſh it out of practice. It is often likewiſe, in theſe caſes, employed to keep down the ſunguous lips that ſpread upon the bone; but it is much more painful than the eſcharotick medicines; though there will be no need of either, if a regular compreſs be kept on the dreſſings: or at worſt, if a flat piece of the prepared ſponge, of the ſize of the ulcer, be rolled on with a tight bandage, it will ſwell on every ſide, and diſtate the ulcer without any pain.

Some caries of the bones are ſo very ſhallow, that they crumble inſenſibly away, and the wound fills up; but when the bone will neither exfoliate nor admit of granulations, it will be proper to ſcrape it with a rugine, or perforate it in many points with a convenient inſtrument down to the quick. In the evil, the bones of the *carpus* and *tarſus* are often affected, but their ſponginess is the reaſon that they are ſeldom cured: ſo that when theſe, or indeed the extremities of any of the bones, are carious through their ſubſtance, it is adviſeable to amputate: though there are inſtances in the evil, but more eſpecially in critical abſceſſes, where after long dreſſing down, the ſplinters, and ſometimes the whole ſubſtance of the ſmall bones, have worked away, and a healthy habit of body coming on, the ulcer has healed; but theſe are ſo rare, that no great dependence is to be laid on ſuch an event. The dreſſings of carious bones, if they are ſtinking, may be doſſils dipt in the tincture of myrrh; otherwiſe thoſe of dry lint are eaſieſt, and keep down the edges of the ulcer better than any other gentle applications.

Burns are generally eſteemed a diſtinct kind of ulcers, and have been treated with a greater variety of applications than any other ſpecies of ſore.

When burns are very ſuperficial, not raiſing ſuddenly any veſication, ſpirits of wine are ſaid to be the quickeſt relief; but whether they be more ſerviceable than embrocations with linſeed oil, is uncertain, though they are uſed very much by ſome perſons whoſe trade ſubjects them often to this misfortune. If the burn excoriates, it is eaſieſt to roll the part up gently with bandages dipt in ſweet oil, or a mixture of *unguent flor ſambu.* with the oil: when the excoriations are very tender, dropping warm milk upon them every dreſſing is very comfortable; or if the patient can bear to have flannels wrung out of it, applied hot, it may be ſtill better: if the burn have formed eſchars, they may be dreſſed with *baſilicon*, though generally oil alone is eaſier; and in theſe ſorts, whatever is the eaſieſt medicine will be the beſt digeſtive There is great care neceſſary to keep down the *fungus* of burns, and heal the wounds ſmooth: to which end, the edges ſhould be dreſſed with lint dipt in *aqu. vitriol.* and dried afterwards; or they may be touched with the vitriol ſtone, and the dreſſings be repeated twice a day. There is alſo a greater danger of contractions from burns after the cure, than from other wounds: to obviate which, embrocations of neats-foot oil, and bandage with paſte-boards, to keep the part extended, are abſolutely neceſſary, where they can be applied.

Explanation of Plate CLVII. fig. 1.

A. a director by which to guide the knife in the opening of abſceſſes that are burſt of themſelves, or firſt punctured with a lancet. This inſtrument ſhould be made either of ſteel, ſilver, or iron; but ſo tempered, that it may be bent and accommodated to the direction of the cavity. It is uſually made quite ſtraight; but that form prevents the operator from holding it firmly while he is cutting. The manner of uſing it is, by paſſing the thumb through the ring, and ſupporting it with the fore finger, while the ſtraight-edged knife is to ſlide along the groove with its edge upwards, towards the extremity of the abſceſs.

B. The ſtraight-edged knife, proper for opening abſceſſes with the aſſiſtance of a director; but which, in few other reſpects, is preferable to the round-edged knife.

C, A crooked needle, with its convex and concave ſides ſharp:

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ſharp: this is uſed only in the ſuture of the tendon, and is made thin, that but few of the fibres of ſo ſlender a body as a tendon may be injured in the paſſing of it. This needle is large enough for ſtitching the *tendo Achillis*.

D, The largeſt crooked needle neceſſary for the tying of any veſſels, and ſhould be uſed with a ligature of the ſize it is threaded with in taking up the ſpermatick veſſels in caſtration, or the femoral and humeral arteries in amputation. This needle may alſo be uſed in ſewing up deep wounds.

E, A crooked needle and ligature of the moſt uſeful ſize, being not much too little for the largeſt veſſels, nor a great deal too big for the ſmalleſt; and therefore in the taking up of the greateſt number of veſſels in an amputation, is the proper needle to be employed. This needle alſo is of a convenient ſize for ſewing up moſt wounds.

F, A ſmall crooked needle and ligature for taking up the leſſer arteries, ſuch as thoſe of the ſcalp, and thoſe of the ſkin that are wounded in opening abſceſſes.

Great care ſhould be taken by the makers of theſe needles, to give them a due temper: for if they are too ſoft, the force ſometimes exerted to carry them through the fleſh, will bend them; if they are too brittle, they ſnap; both which accidents may happen to be terrible inconveniencies, if the ſurgeon be not provided with a ſufficient number of them. It is of great importance alſo to give them the form of part of a circle, which makes them paſs much more readily round any veſſel, than if they were made partly of a circle, and partly of a ſtraight line, and in taking up veſſels at the bottom of a deep wound is abſolutely neceſſary, it being impracticable to turn the needle with a ſtraight handle, and bring it round the veſſel when in that ſituation. The convex ſurface of the needle is flat, and its two edges are ſharp. Its concave ſide is compoſed of two ſurfaces, riſing from the edges of the needle, and meeting in a ridge or eminence, ſo that the needle has three ſides. The beſt materials for making ligatures, are the flaxen thread that ſhoemakers uſe; which is ſufficiently ſtrong when four, ſix, or eight of the threads are twiſted together and waxed; and is not ſo apt to cut the veſſels, as threads that are more finely ſpun.

G, A ſtraight needle, ſuch as glovers uſe, with a three-edged point, uſeful in the uninterrupted ſuture, in the ſuture of tendons, where the crooked one *C*, is not preferred, and in ſewing up dead bodies, and is rather more handy for taking up the veſſels of the ſcalp.

Of SUTURES.

WHEN a wound is recent, and the parts of it are divided by a ſharp inſtrument, without any farther violence, and in ſuch a manner that they may be made to approach each other, by being returned with the hands, they will, if held in cloſe contact for ſome time, re-unite by inoſculation, and cement like one branch of a tree ingrafted on another. To maintain them in this ſituation, ſeveral ſorts of ſutures have been invented, and formerly practiſed; but the number of them has of late been very much reduced. Thoſe now chiefly deſcribed, are the interrupted, the glover's, the quilled, the twiſted, and the dry ſutures; but the interrupted and twiſted, are almoſt the only uſeful ones; for the quilled ſuture is never preferable to the interrupted; the dry future is ridiculous in terms, ſince it is only a piece of plaiſter applied in many different ways to re-unite the lips of a wound; and the glover's, or uninterrupted ſtitch, which is adviſed in ſuperficial wounds, to prevent the deformity of a ſcar, does rather, by the frequency of the ſtitches, occaſion it, and is therefore to be rejected in favour of a compreſs and ſticking plaiſter; the only inſtance where it ſhould be uſed, is in a wound of the inteſtine.

Wounds are not fit ſubjects for ſuture, when there is either a contuſion, laceration, loſs of ſubſtance, great inflammation, difficulty of bringing the lips into appoſition, or ſome extraneous body inſinuated into them; though ſometimes a lacerated wound may be aſſiſted with one or two ſtitches. It has formerly been forbidden to ſew up wounds of the head; but this precaution is very little regarded by the moderns.

If we ſtitch up a wound that has none of theſe obſtacles, we always employ the interrupted ſuture, paſſing the needle two, three, or four times, in proportion to the length of it, though there can ſeldom be more than three ſtitches required.

The method of doing it is this: the wound being emptied of the grumous blood, and your aſſiſtant having brought the lips of it together, that they may lie quite even; you carefully carry your needle from without, inwards to the bottom, and ſo on from within, outwards; uſing the caution of making the puncture far enough from the edge of the wound, which will not only facilitate the paſſing the ligature, but will alſo prevent it from eating through the ſkin and fleſh; this diſtance may be three or four tenths of an inch: as many more ſtitches as you ſhall make, will be only repetitions of the ſame proceſs. The threads being all paſſed, you begin tying them in the middle of the wound, though, if the lips are held carefully together all the while, as they ſhould be, it will be of no great conſequence which is done firſt. The moſt uſeful kind of knot in large wounds, is a ſingle one firſt; over this, a little linen compreſs, on which is to be made another ſingle knot; and then a ſlip-knot, which may be looſened upon any inflammation: but in ſmall wounds, there is no danger from the double knot alone, without any compreſs to tie it upon; and this is moſt generally practiſed. If a violent inflammation ſhould ſucceed, looſening the ligature only will not ſuffice; it muſt be cut through and drawn away, and the wound be treated afterwards without any ſuture. When the wound is ſmall, the leſs it is diſturbed by dreſſing, the better; but in large ones, there will ſometimes be a conſiderable diſcharge, and if the threads be not cautiouſly carried through the bottom of it, abſceſſes will frequently enſue from the matter being pent up underneath, and not finding iſſue. If no accident happen, you muſt, after the lips are firmly agglutinated, take away the ligatures, and dreſs the orifices which they leave.

It muſt be remembered, that during the cure, the ſuture muſt be always aſſiſted by the application of bandage, if poſſible, which is frequently of the greateſt importance; and that ſort of bandage with two heads, and a ſlit in the middle, which is by much the beſt, will in moſt caſes be found practicable.

The twiſted ſuture being principally employed in the hare-lip, we ſhall reſerve its deſcription for the ſection on that head.

Of the Suture *of* Tendons.

WOUNDS of the tendons are not only known to heal again, but even to admit of ſewing up like thoſe of the fleſhy parts,

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parts, though they do not re-unite in ſo ſhort a time. When a tendon is partly divided, it is generally attended with an exceſſive pain, inflammation, &c. in conſequence of the remaining fibres being ſtretched and forced by the action of muſcle, which neceſſarily will contract more when ſome of its reſiſtance is taken away. To obviate this miſchief, it has been hitherto an indiſputable maxim in ſurgery, to cut the tendon quite through, and immediately afterwards perform the future. But this practice is not adviſeable; for though the diviſion of the tendon afford preſent eaſe, yet the mere flexion of the joint will have the ſame effect, if, for example, it be a wound of a flexor tendon: beſides, in order to ſew up the extremities of the tendon when divided, we are obliged to put the limb in ſuch a ſituation, that they may be brought into contact, and even to ſuſtain it in that poſture to the finiſhing of the cure: if then, the poſture will lay the tendon in this poſition, we can likewiſe keep it ſo without uſing the future, and are more ſure of its not ſlipping away, which ſometimes happens from any careleſs motion of the joint, when the ſtitches have almoſt worn through the lips of the wound; on which account, it is by all means adviſeable, in this caſe, to forbear the future, and only to favour the ſituation of the extremities of the tendon, by placing the limb properly.

But when the tendon is quite ſeparated, and the ends are withdrawn from one another, having brought them together with your fingers, you may ſew them with a ſtraight triangular pointed needle, paſſing it from without inwards, and from within outwards in ſmall tendons; about three tenths of an inch from their extremities, and in the *tendo Achillis* half an inch.

As the wound of the ſkin will be nearly tranverſe, it ſhould not be raiſed to expoſe more of the tendon, but rather ſewed up with it, which will conduce to the ſtrength of the future. The knot of the ligature is to be made as in other wounds, and the dreſſings are to be the ſame: there is a ſort of thin crooked needle that cuts on its concave and convex ſides, which is very handy in the future of large tendons, and to be preferred to the ſtraight one. During the cure, the dreſſings muſt be ſuperficial, and the parts kept ſteady with paſteboard and bandage: the ſmall tendons reunite in three weeks, but the *tendo Achillis* requires ſix at leaſt.

Of the Gastrorapht.

This word ſignifies no more than ſewing up any wound of the belly; yet in common acceptation, it implies that the wound of the belly is complicated with another of the inteſtine. Now the ſymptoms laid down for diſtinguiſhing when the inteſtine is wounded, do not with any certainty determine it to be wounded only in one place; which want of information makes it abſurd to open the abdomen in order to come at it: if ſo, the operation of ſtitching the bowels can only take place where they fall out of the abdomen, and we can ſee where the wound is, or how many wounds there are: if it happens that the inteſtines fall out unwounded, the buſineſs of the ſurgeon is to return them immediately, without waiting for ſpirituous or emollient fomentations; and in caſe they puff up ſo as to prevent their reduction by the ſame orifice, you may with a knife or probe-ſciſſars ſufficiently dilate it for that purpoſe, or even prick them to let out the wind.

Upon the ſuppoſition of the inteſtine being wounded in ſuch a manner as to require the operation, (for in ſmall punctures it is not neceſſary,) the method of doing it may be this: Taking a ſtraight needle with a ſmall thread, you lay hold of the bowel with your left hand, and ſew up the wound by the glover's ſtitch, that is, by paſſing the needle through the lips of the wound, from within outwards all the way, ſo as to leave a length of thread at both ends, which are to hang out of the inciſion of the abdomen; then carefully making the interrupted future of the external wound, you pull the bowel by the ſmall threads into contact with the peritonæum, in order to procure an adheſion, and tie them upon a ſmall bolſter of linen. In about ſix days, it is ſaid the ligature of the inteſtine will be looſe enough to be cut and drawn away, which muſt be done without great force; in the interim, the wound is to be treated with ſuperficial dreſſings, and the patient to be kept very ſtill and low.

Of the Bubonocele.

When the inteſtine or omentum falls out of the abdomen into any part, the tumour in general is known by the name of *hernia*; which is farther ſpecified either from the difference of ſituation, or the nature of its contents. When the inteſtine or omentum falls through the navel, it is called a *hernia umbilicalis*, or *exomphalos*; when through the rings of the abdominal muſcles into the groin, *hernia inguinalis*; or if into the ſcrotum, *ſcrotalis*: theſe two laſt, though the firſt only is properly ſo called, are known by the name of bubonocele. When they fall under the *ligamentum Fallopii*, through the ſame paſſage that the iliac veſſels creep into the thigh, it is called *hernia femoralis*. The bubonocele is alſo ſometimes accompanied with a deſcent of the bladder: however, the caſe is very rare; but when it occurs, it is known by the patient's inability to urine, till the hernia of the bladder is reduced within the pelvis. With regard to the contents characteriſing the ſwelling, it is thus diſtinguiſhed: if the inteſtine only is fallen, it becomes an *enterocele*; if the omentum, (*epiploon*) *epiplocele*; and if both, *entero-epiplocele*. There is, beſides theſe, another kind of hernia mentioned and deſcribed by the moderns, when the inteſtine or omentum is inſinuated between the interſtices of the muſcles, in different parts of the belly: this hernia has derived its name from the place affected, and is called the *hernia ventralis*; and laſtly, there have been a few inſtances, where the inteſtines or omentum have fallen thro' the great foramen of the iſchium into the internal part of the thigh, between and under the two anterior heads of the triceps muſcle.

All the kinds of hernias of the inteſtines and omentum, are owing to a preternatural dilatation of the particular orifices through which they paſs, and not to a laceration of them.

The rupture of the groin, or ſcrotum, is the moſt common ſpecies of hernia, and in young children is vere frequent; but it rarely happens in infancy, that any miſchiefs ariſe from it. For the moſt part, the inteſtine returns of itſelf into the cavity of the abdomen, whenever the perſon lies down, at leaſt a ſmall degree of compreſſion will make it. To ſecure the inteſtine when returned into its proper place, there are ſteel truſſes now ſo artfully made, that by being accommodated exactly to the part, they perform the office of a bolſter, without galling, or even fitting uneaſy on the patient. Theſe inſtruments are of ſo great ſervice, that

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were people who are ſubject to ruptures always to wear them, very few would die of this diſtemper; ſince it often appears, upon inquiry, when we perform the operation for the bubonocele, that the neceſſity of the operation is owing to the neglect of wearing a truſs.

In the application of a truſs to theſe kinds of ſwellings, a great deal of judgment is ſometimes neceſſary, and for want of it, we daily ſee truſſes put even on buboes, indurated teſticles, hydroceles, &c.

If there is a rupture of the inteſtine only, it is eaſily, when returned into the abdomen, ſupported by an inſtrument; but if of the omentum, notwithſtanding it may be returned, yet the reduction ſeldom brings relief, unleſs there is only a ſmall quantity of it; for the omentum will lie uneaſy in a lump at the bottom of the belly, and, upon removal of the inſtrument, drop down again imediately, upon which account ſeeing the little danger and pain there is in this kind of hernia, nothing need be uſed but a bag truſs, to ſuſpend the ſcrotum, and prevent poſſibly by that means the increaſe of the tumour. The difference of theſe tumours will be diſtinguiſhed by the feel; that of the omentum feeling flaccid and rumpled, the other more even, flatulent, and ſpringy.

Sometimes, in a rupture of both the inteſtine and omentum, the gut may be reduced, but the omentum will ſtill remain in the ſcrotum; and when thus circumſtanced, a ſteel truſs muſt be uſed.

We have hitherto conſidered the rupture as moveable; but it happens frequently, that the inteſtine after it has paſſed the rings of the muſcles, is preſently inflamed, which enlarging the tumour, prevents the return of it into the abdomen, and becoming every moment more and more ſtrangled, it ſoon tends to a mortification, unleſs we dilate the paſſages through which it is fallen, with ſome inſtrument, to make room for its return; which dilatation is the operation for the Bubonocele.

It rarely happens that patients ſubmit to this inciſion before the gut is mortified, and it is too late to do ſervice; not but that there are inſtances of people ſurviving ſmall gangrenes, and even perfectly recovering afterwards.

In mortifications of the bowels, when fallen out of the abdomen into the navel, it is not very uncommon for the whole gangrened inteſtine to ſeparate from the ſound one, ſo that the excrement muſt neceſſarily ever after be diſcharged at that orifice: there are likewiſe a few inſtances, where the rupture of the ſcrotum has mortified, and become the anus, the patient doing well in every other reſpect

Before the performance of the operation for the bubonocele, which is only to be done in the extremity of danger, the milder methods are to be tried; theſe are, ſuch as will conduce to ſoothe the inflammation.

Perhaps except the pleuriſy, no diſorder is more immediately relieved by plentiful bleeding than this. Clyſters repeated, one after another, three or four times, if the firſt or ſecond are either retained too long, or immediately returned, prove very efficacious: theſe are ſerviceable, not only as they empty the great inteſtines of their excrements and flatulencies, which laſt are very dangerous, but they likewiſe prove a comfortable fomentation, by paſſing thro' the colon all around the abdomen. The ſcrotum and groin muſt, during the ſtay of the clyſter, be bathed with warm ſtoops wrung out of a fomentation; and after the part has been well fomented, you muſt attempt to reduce the rupture: for this purpoſe, let your patient be laid on his back, ſo that his buttocks may be conſiderably above his head; the bowels will then retire towards the diaphragm, and give way to thoſe which are to be puſhed in. If, after endeavouring two or three minutes, you do not find ſucceſs, you may ſtill repeat the trial.

If, notwithſtanding theſe means, the patient continues in very great torture, though not ſo bad as to threaten an immediate mortification, we muſt apply ſome ſome ſort of poultice to the ſcrotum; ſuch as equal parts of oil and vinegar made into a proper conſiſtence with oat meal: after ſome few hours, the fomentation is to be repeated, and the other directions put in practice.

After all, ſhould the pain and tenſeneſs of the part continue, and hiccoughs and vomitings of the excrements ſucceed, the operation muſt take place; for if you wait until a languid pulſe, cold ſweats, ſubſiding of the tumour, and emphyſematous feel come on, it will be moſt likely too late, as they are pretty ſure ſymptoms of a mortification

To conceive rightly of the occurrences in this operation, it muſt be remembered, that in every ſpecies of rupture, a portion of the *peritonæum* generally falls down with whatever makes the *hernia*; which, from the circumſtance of containing immediately the contents of the tumour, is called the *ſac* of the *hernia*. Now, the portion of the *peritonæum*, which uſually yields to the impulſion of the deſcending *viſcera*, is that which correſponds with the inmoſt opening of the abdominal muſcles, juſt where the *membrana cellularis peritonæi* begins to form the *tunica vaginalis* of the ſpermatic cord; ſo that the *ſac* with the *viſcera* inſinuate themſelves into the *tunica vaginalis* of the ſpermatic cord, and lie upon the *tunica vaginalis* of the teſticle: nevertheleſs, upon examination, the contents of the *hernia* are ſometimes in contact with the teſticle itſelf; that is to ſay, within the *tunica vaginalis* of the teſticle. For ſome months during geſtation, the *teſtes* of the *fœtus* remain in the *abdomen*; and when they deſcend into the *tunica vaginalis*, there is an immediate communication betwixt the cavity of the *abdomen*, and the cavity of the *tunica vaginalis* which, in proceſs of time, becomes obliterated by the coalition of the *tunick* with the cord; but if it happen, before the coalition be effected, that the inteſtine or the *omentum* fall into the *ſcrotum*, they will neceſſarily remain in contact with the *teſtes*

From this deſcription of the deſcent of the *viſcera*, it is evident that the *herniary ſac* is contained within the *tunica vaginalis*, and ought to give the idea of one bag incloſing another: but in the operation, this diſtinction of coats does not always appear; for the *herniary ſac* ſometimes adheres ſo firmly to the *tunica vaginalis*, that together they make one thick coat: this adheſion may poſſibly reſult from the preſent inflammation of the parts, which has rendered the operation neceſſary.

The beſt way of laying your patient will be on a table about three feet four inches high, letting his legs hang down; then properly ſecuring him, you begin your inciſion above the rings of the muſcles, beyond the extremity of the tumour, and bring it down about half the length of the *ſcrotum* through the *membrana adipoſa*, which will require very little trouble to ſeparate from the *tunica vaginalis*, and conſequently will expoſe the rupture for the farther proceſſes of the operation. If a large veſſel is opened by the inciſion, it muſt be taken up before you proceed further.

When

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When the *tunica vaginalis* is laid bare, you muſt cut carefully through it and the *peritonæum*, in order to avoid pricking the inteſtines.

The *peritonæum* being cut through, we arrive to its contents, the nature of which will determine the next proceſs: for if it is inteſtine only, it muſt directly be reduced, but if there is any mortified *omentum*, it muſt be cut off; in order to which it is adviſed to make a ligature above the part wounded, to prevent an hæmorrhage; but it is quite needleſs, and in ſome meaſure pernicious, as it puckers up the inteſtine, and diſorders its ſituation, if made cloſe to it.

When the *omentum* is removed, we next dilate the wound; to do which with ſafety an infinite number of inſtruments have been invented: but there is none we can uſe in this caſe with ſo good management as a knife; and the finger in this operation is often a much better defence againſt pricking the bowels, than a director. The knife muſt be a little crooked and blunt at its extremity, like the end of a probe. Some ſurgeons perhaps may not be ſteady enough to cut dexterouſly with a knife, and may therefore perform the inciſion with probe-ſciſſars carefully introducing one blade between the inteſtine and circumference of the rings, and dilating upwards, and a little obliquely outwards. When the finger and knife only are employed, the manner of doing the operation will be by preſſing the gut down with the fore-finger, and carrying the knife between it and the muſcles, ſo as to dilate upwards about an inch, which will be a wound generally large enough: but if, upon examination, it ſhall appear that the inteſtine is ſtrangulated within the *abdomen*, which may poſſibly happen from a contraction of the *peritonæum* near the entrance into the *ſac*; in that caſe, the inciſion muſt be continued through the length of the contracted channel, or the conſequence will be fatal, notwithſtanding the inteſtine be reſtored into the *ſcrotum*: on this account the operator ſhould paſs his finger up the *ſac* into the *abdomen*, after the reduction of the gut, in order to diſcover whether it be ſafely returned into its proper place.

The opening being made, the inteſtine is gradually to be puſhed into the *abdomen*, and the wound to be ſtitched up; for this purpoſe, ſome adviſe the quilled, and others the interrupted ſuture, to be paſſed through the ſkin and muſcles; but as there is not ſo much danger of the bowels falling out when a dreſſing and bandage are applied, and the patient all the while kept upon his back, but that it may be prevented by one or two ſlight ſtitches through the ſkin only, it is by all means adviſeable to follow this method, ſince the ſtricture of a ligature in theſe tendinous parts may be dangerous.

Hitherto, in the deſcription of the *bubonocele*, we have ſuppoſed the contents to be looſe, or ſeparate in the *ſac*: but it happens ſometimes in an operation, that we find not only an adheſion of the outſide of the *peritonæum* to the *tunica vaginalis*, and ſpermatic veſſel, but likewiſe of ſome part of the inteſtines to its internal ſurface; and in this caſe there is ſo much confuſion, that the operator is often obliged to extirpate the teſticle, in order to diſſect away and diſintangle the gut; though if it can be done without caſtration, it ought: however, this accident happens rarely except in thoſe ruptures that have been a long time in the *ſcrotum* without returning: in which caſe the difficulty and hazard of the operation are ſo great, that, unleſs urged by the ſymptoms of an inflamed inteſtine, it ſhould not be undertaken.

The dreſſing of the wound firſt of all may be with dry lint, and afterwards as directed under the head of wounds.

The operation of the *bubonocele* in women ſo nearly reſembles that performed on men, that it requires no particular deſcription: only in them the rupture is formed by the inteſtine or *omentum* falling down through the paſſage of the *ligamentum rotundum* into the groin, or one of the *labia pudendi*; where cauſing the ſame ſymptoms, as when obſtructed in the *ſcrotum*, it is to be returned by the dilatation of that paſſage.

Of the EPIPLOCELE.

THERE have been a few inſtances where ſo great a quantity of the *omentum* has fallen into the *ſcrotum*, that, by drawing the ſtomach and bowels downwards, it has excited vomitings, inflammation, and the ſame train of ſymptoms as happen in a *bubonocele*; in which caſe, the operation of opening of the *ſcrotum* is neceſſary: the inciſion muſt be made in the manner of that for the rupture of the inteſtine, and the ſame rules obſerved with regard to the *omentum* that are laid down in the laſt ſection. It is neceſſary alſo, the rings of the muſcles ſhould be dilated; or otherwiſe, though you have taken away ſome of the mortified part of the *omentum*, the reſt that is out of its place, and ſtrangled in the perforation, will gangrene alſo. The wound is to be treated in the ſame manner as that after the operation of the *bubonocele*.

Of the HERNIA FEMORALIS.

THIS ſpecies of rupture is the ſame in both ſexes, and formed by the falling of the *omentum* or inteſtine, or both of them, into the inſide of the thigh, through the arch made by the *os pubis* and *ligamentum Fallopii*, where the iliac veſſels and tendons of the *pſoas* and *iliacus internus* muſcles paſs from the *abdomen*. It is very neceſſary ſurgeons ſhould be aware of the frequency of this diſorder, which creates the ſame ſymptoms as other ruptures, and muſt firſt of all be treated by the ſame methods: the manner of operating in the reduction is here too ſo exactly the ſame, with the difference of dilating the ligament inſtead of the rings of the muſcles, that it would be a mere repetition of the operation for the *bubonocele* to give any deſcription of it: only it may be obſerved, that the ſpermatic cord, as it enters into the *abdomen*, lies nearly tranſverſe to the inciſion, and cloſe in contact with the ligament; ſo that unleſs you make the dilatation obliquely outwards, inſtead of perpendicularly upwards, you will probably divide thoſe veſſels.

Of the EXOMPHALOS.

THIS rupture is owing to a protruſion of the inteſtine, or *omentum*, or both of them, at the navel, and rarely happens to be the ſubject of an operation: for though the caſe is common, yet moſt of them are gradually formed from very ſmall beginnings; and if they do not return into the *abdomen* upon lying down, in all probability they adhere without any great inconvenience to the patient, till ſome time or other an inflammation falls upon the inteſtines, which ſoon brings on a mortification, and death; unleſs, by great chance, the mortified part ſeparates from the ſound one, leaving its extremity to perform the office of an *anus*: in this emergency, however, it is adviſeable to attempt the reduction, if called in at the beginning, though the univerſal adheſion of the *ſac* and its contents are a great obſtacle to the ſucceſs:

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the inſtance in which it is moſt likely to anſwer, is, when the rupture is owing to any ſtrain, or ſudden jerk, and is attended with thoſe diſorders which follow upon the ſtrangulation of a gut.

In this caſe, having tried all other means in vain, the operation is abſolutely neceſſary; which may be thus performed: Make the inciſion ſomewhat above the tumour, on the left ſide of the navel, through the *membrana adipoſa*; and then emptying the ſac of its water, or mortified omentum, dilate the ring with the ſame crooked knife, conducted on your finger, as in the operation for the bubonocele; after this, return the inteſtines and omentum into the abdomen, and dreſs the wound without making any ligature but of the ſkin only.

Of the Hernia Ventralis.

The *hernia ventralis*, which ſometimes appears between the recti muſcles, is very large; but that tumour which requires the operation is ſeldom bigger than a walnut, and is a diſeaſe not ſo common as to have been obſerved by many: but there are caſes enough known, to put a ſurgeon upon inquiry after it. When the patient is ſuddenly taken with all the ſymptoms of a rupture, without any appearance of one in the navel, ſcrotum, or thigh, the manner of dilating it will be the ſame as that above directed in the other hernias: after the operation in this and all hernias where the inteſtines have been reduced, it will be convenient to wear a truſs, ſince the cicatrix is not always firm enough in any of them to prevent a relapſe.

Explanation of Fig. 2. Plate CLVII.

A, The round-edged knife, of a convenient ſize for almoſt all operations where a knife is uſed: the make of it will be better underſtood by the figure than any other deſcription; only it may be remarked, that the handle is made of a light wood, as indeed the handles of all inſtruments ſhould be, that the reſiſtance to the blades may be better felt by the ſurgeon.

B, A pair of probe-ſciſſars, which require nothing very particular in their form, but that the lower blade ſhould be made as ſmall as poſſible, ſo that it is ſtrong, and has a good edge; becauſe, being chiefly uſed in fiſtulas *in ano*, the introduction of a thick blade into the ſinus, which is generally narrow, would be very painful to the patient.

C, The crooked knife with the point blunted, uſed in the operation of the bubonocele.

Of the Hydrocele.

The *hydrocele*, called alſo *hernia aquoſa*, *hydrops ſcroti*, and *hydrops teſtis*, is a watery tumour of the ſcrotum; which, notwithſtanding the multiplicity of diſtinctions uſed by writers, is but of two kinds; the one when the water is contained in the *tunica vaginalis*, and the other when in the *membrana cellularis ſcroti*. This laſt is almoſt always complicated with an anaſarca; which ſpecies of dropſy is an extravaſation of water lodged in the cells of the *membrana adipoſa*; and when thus circumſtanced, will not be difficult to be diſtinguiſhed; beſides that it is ſufficiently characteriſed by the ſhining and ſoftneſs of the ſkin, which gives way to the leaſt impreſſion, and remains pitted for ſome time. The penis is likewiſe ſometimes enormouſly enlarged, by the inſinuation of the fluids into the *membrana cellularis*; all which ſymptoms are abſolutely wanting in the dropſy of the *tunica vaginalis*.

In the dropſy of the *membrana cellularis ſcroti*, the puncture with the trocar is recommended by ſome, and little orifices made here and there with the point of a lancet by others; or a ſmall ſkane of ſilk paſſed by a needle through the ſkin, and out again at the diſtance of two or three inches, to be kept in the manner of a ſeton, till the waters are quite drained: but the two firſt methods avail very little, as they open but few cells; and the laſt cannot be ſo efficacious in that reſpect as inciſions, and will be much more apt to become troubleſome, and even to gangrene.

Indeed it is not often proper to perform any operation at all upon this part, ſince the *membrana cellularis ſcroti*, being a continuation of the *membrana adipoſa*, ſcarifications made through the ſkin in the ſmall of the legs will effectually empty the ſcrotum: and this place ought rather to be pitched upon than the other, as being more likely to anſwer the purpoſe by reaſon of its dependency: however, it ſometimes happens, that the waters fall in ſo great quantities into the ſcrotum, as, by diſtending it, to occaſion great pain, and threaten a mortification: the prepuce of the penis alſo becomes very often exceſſively dilated, and ſo twiſted, that the patient cannot void his urine. In theſe two inſtances, an inciſion of three inches long ſhould be made on each ſide of the ſcrotum, quite through the ſkin into the cells containing the water, and two or three of half an inch long, in any part of the penis, with a lancet or knife; all which may be done with great ſafety, and ſometimes with the ſucceſs of carrying off the diſeaſe of the whole body.

The dropſy of the *tunica vaginalis* is owing to a preternatural diſcharge of that which is continually ſeparating in a ſmall quantity, on the internal ſurface of the tunick, for the moiſtening or lubricating the teſticle, and which collecting too faſt accumulates and forms in time a ſwelling of great magnitude: this is what we take to be the other ſpecies of hydrocele, and the only one beſides.

The hydrocele of the *tunica vaginalis* is very eaſily to be diſtinguiſhed from the hydrocele of the *membrana cellularis*, by the preceding deſcription of that ſpecies of dropſy: We ſhall now explain how it differs from the other tumours of the ſcrotum, *viz.* the *bubonocele*, *epiplocele*, and enlarged teſticle. In the firſt place, it is ſeldom or never attended with pain in the beginning, and is very rarely to be imputed to any accident, as the hernia's of the omentum and inteſtine are. From the time it firſt makes its appearance, it very ſeldom is known to appear or diminiſh; but generally continues to increaſe, though in ſome much faſter than in others; in one perſon growing to a very painful diſtenſion in a few months, whilſt in another it ſhall not be troubleſome in many years; nay, ſhall ceaſe to ſwell at a certain period, and ever after continue in that ſtate without any notable diſadvantage; though this laſt caſe very rarely happens. In proportion as it enlarges, it becomes more tenſe, and then is ſaid to be tranſparent: indeed the tranſparency is made the chief criterion of the diſtemper, it being conſtantly adviſed to hold a candle on one ſide of the ſcrotum, which it is ſaid will ſhine through the the other, if there be water. But this experiment does not always anſwer, becauſe ſometimes the tunica vaginalis is very much thickened, and ſometimes the water itſelf is not tranſparent: ſo that to judge poſitively if there be a fluid, we muſt be guided by feeling a fluctuation; and

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and though we do not perhaps evidently perceive it, yet we may be perſuaded there is a fluid of ſome kind, if we are once aſſured that the diſtenſion of the *tunica vaginalis* makes the tumour; which is to be diſtinguiſhed in the following manner.

If the the inteſtine, or omentum, form the ſwelling, they will be ſoft and pliable (unleſs inflamed;) uneven in their ſurface, particularly the omentum; and both of them extend themſelves up from the ſcrotum quite into the very abdomen: whereas, in the hydrocele, the tumour is tenſe and ſmooth, and ceaſes before or at its arrival to the rings of the abdominal muſcles; becauſe the upper extremity of the *tunica vaginalis* terminates at ſome diſtance from the ſurface of the belly.

When the teſticle is increaſed in its ſize, the tumour is rounder; and if not attended with an enlargement of the ſpermatic veſſels, the cord may be eaſily diſtinguiſhed between the ſwelling and abdomen; but without this rule of diſtinction, either the pain, or the very great hardneſs, will diſcover it to be a diſeaſe of the teſticle.

As to the cure of this diſtemper by external applications, or internal means, little is to be expected; on which account, it is generally adviſeable to wait with patience until the tumour becomes troubleſome, and then to tap it with a lancet or trocar. In opening with a lancet, it may poſſibly happen, that the orifice of the ſkin ſhall ſlip away from that of the tunick, and prevent the egreſs of the water: to obviate which inconvenience, you may introduce a probe, and by that means ſecure the exact ſituation of the wound; but if the coats are very much thickened, it will be adviſeable to uſe the trocar, rather than the lancet. It is ſpoken of as an eaſy thing, to hold the teſticle with the left hand, while we make the puncture with the right; but when the *tunica vaginalis* is very tenſe, it cannot well be diſtinguiſhed: however, there is no danger of wounding it, if you make the puncture in the inferior part of the ſcrotum. During the evacuation, the ſcrotum muſt be regularly preſſed; and after the operation, a little piece of dry lint and ſticking plaſter are ſufficient.

This method of tapping is called the palliative cure; not but that it does now and then prove an abſolute one. To prevent the relapſe of this diſeaſe, ſurgeons preſcribe the making a large wound, either by inciſion or cauſtic, that upon healing it afterwards, the firmneſs and contraction of the cicatrix may bind up the relaxed lymphatic veſſels, and obſtruct the further preternatural effuſion of their contents: but this practice is generally attended with ſo much trouble, that, notwithſtanding its ſucceſs in the end, moſt ſurgeons prefer the palliative.

Of CASTRATION.

THIS is one of the moſt melancholy operations in the practice of ſurgery, ſince it ſeldom takes place but in diſorders into which the patient is very apt to relapſe, *viz.* thoſe of a ſchirrhus, or cancer: for under moſt of the ſymptoms deſcribed as rendering it neceſſary, it is abſolutely improper; ſuch as a hydrocele, abſceſs of the teſtes, an increaſing mortification, or what is ſometimes underſtood by a ſarcocele; of which laſt it may not be amiſs to ſay a word. In the utmoſt latitude of the meaning of this term, it is received as a fleſhy ſwelling of the teſticle itſelf, called likewiſe *hernia carnoſa*; or in ſome enlargements, ſuch as in a clap, more frequently *hernia humoralis*; but generally ſpeaking, is conſidered as a fleſhy excreſcence formed on the body of the teſtis, which becoming exceedingly hard and tumefied, for the moſt part is ſuppoſed to demand extirpation, either by cutting or burning away the induration, or amputating the teſticle. But this maxim too precipitately received, has very much miſguided the practitioners of ſurgery.

It ſometimes happens that the epidydymis is tumefied, independent of the teſticle; and feeling like a large adventitious excreſcence, anſwers very well to the idea moſt ſurgeons form of a *ſarcocele:* but not being aware of the different nature and texture of the epididymis, they have frequently confounded its diſorders with thoſe of the teſticle itſelf, and equally recommended extirpation in the induration of one or the other. But all indurations of the glandular part of the teſticle not tending to inflammation and abſceſs, generally, if not always, lead on to ſcirrhus and cancers; whereas thoſe of the epididymis ſeldom or never do. It is true, in ſpite of internal or external means, theſe laſt often retain their hardneſs, and ſometimes ſuppurate, but however without much danger in either caſe.

Before caſtration, it is laid down as a rule to inquire whether the patient has any pain in his back, and in that caſe to reject the operation, upon the reaſonable preſumption of the ſpermatic veſſels being likewiſe diſeaſed: but we are not to be too haſty in this determination; for the mere weight of the tumour ſtretching the cord, will ſometimes create this complaint. To learn the cauſe then of this pain in the back, when the ſpermatic cord is not thickened, let your patient be kept in bed, and ſuſpend his ſcrotum in a bag-truſs, which will relieve him, if diſordered by the weight only; but if the ſpermatic cord is thickened or indurated, which diſeaſe, when attended with a dilatation of the veſſels of of the ſcrotum, is known by the Greek appellations *circocele* and *varicocele*, the caſe is deſperate, and not to be undertaken.

But ſuppoſing no obſtacle in the way to the operation, the method of doing it may be this: Lay your patient on a ſquare table of about three feet four inches high, letting his legs hang down, which, as well as the reſt of his body, muſt be held firm by the aſſiſtants. Then with a knife begin your wound above the rings of the abdominal muſcles, that you may have room afterwards to tie the veſſels, ſince for want of this caution operators will neceſſarily be embarraſſed in making the ligature: then carrying it through the *membrana adipoſa*, it muſt be continued downward, the length of it being in proportion to the ſize of the teſticle. If it is very ſmall, it may be diſſected away without taking any part of the ſcrotum. If the teſticle, for inſtance, weighs twenty ounces; having made one inciſion about five inches long, a little circularly, begin a ſecond in the ſame point as the firſt, bringing it with an oppoſite ſweep to meet the other in the inferior part, in ſuch a manner as to cut out the ſhape of an oval whoſe ſmalleſt diameter ſhall be two inches: after this, diſſect away the body of the tumour, with the piece of ſkin on it, from the ſcrotum; firſt taking up ſome of the blood-veſſels, if the hæmorrhage is dangerous. Then paſs a ligature round the cord, pretty near the abdomen, and if you have ſpace between the ligature and teſticle, a ſecond about half an inch lower, to make the ſtoppage of blood ſtill more ſecure. The ligatures may be tied with what is called the *ſurgeon's knot*, where the thread is paſſed through the ring twice. This done, cut off the teſticle a little underneath the ſecond ligature, and paſs a needle from the ſkin at the lower part of the wound through the ſkin at the upper part, in ſuch a manner as to envelope in

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ſome degree the ſound teſticle, which will greatly facilitate and quicken the cure; or if one ſtitch will not anſwer the purpoſe, you may repeat it in ſuch part of the wound where the ſkin on each ſide lies moſt looſe.

In large tumours, it is adviſeable to cut away great part of the ſkin; for beſides that the hæmorrhage will be much leſs in this caſe, and the operation greatly ſhortened, the ſkin by the great diſtenſion having been rendered very thin, will great part of it, if not taken away, ſphacelate, and the reſt be more prone to degenerate into a cancerous ulcer.

Of the PHYMOSIS.

THE *phymoſis* ſignifies no more than ſuch a ſtraitneſs of the prepuce, that the glans cannot be denuded; which if it becomes troubleſome, ſo as to prevent the egreſs of the urine, or conceal under it chancres, or foul ulcers, quite out of the reach of application, is to be cut open. It ſometimes happens, that children are born imperforate; in which caſe, a ſmall puncture, dreſſed afterwards with a tent, effects a cure. But this operation is chiefly practiſed in venereal caſes, in order to expoſe chancres either on the glans or withinſide the prepuce itſelf: and here, if the prepuce is not very callous and thick, a mere inciſion will anſwer; which may be made either with the ſciſſars, or by ſlipping a knife between the ſkin and glans to the very extremity, and cutting it up: the laſt method is more eaſy than that of the ſciſſars; but it is ſafer to make the wound on the ſide of the prepuce than upon the upper part, for ſometimes the great veſſels on the *dorſum penis* afford a terrible hæmorrhage; though the prepuce remains better ſhaped after an inciſion made in the upper part, and therefore is to be preferred by thoſe who underſtand how to take up the veſſels. In children it ſometimes happens that the prepuce becomes very much contracted; and in that caſe, it is accidentally ſubject to ſlight inflammations, which bring on ſome ſymptoms of the ſtone; but the diſorder is always removed by the cure of the phymoſis.

If the prepuce be very large and indurated, the opening alone will not ſuffice; and it is more adviſeable to take away the calloſity by circumciſion, which muſt be performed with a knife; and if the artery bleed much, it muſt be taken up with a ſmall needle and ligature.

Of the PARAPHYMOSIS.

THE paraphymoſis is a diſeaſe of the penis, where the prepuce is fallen back from the glans, and cannot be brought forwards to cover it. There are many whoſe penis is naturally thus formed, but without any inconvenience; ſo that ſince the time of the Romans, (ſome of whom thought it indecent to have the glans bare,) it has not been uſual to perform any operation upon that account; but we read the ſeveral proceſſes of it deſcribed very particularly by Celſus, who does not ſpeak of it as an uncommon thing. Moſt of the inſtances of this diſtemper are owing to a venereal cauſe; but there are ſome where the prepuce is naturally very tight, which take their riſe from a ſudden retraction of it, and immediate inlargement of the glans preventing its return. Sometimes it happens that the ſurgeon ſucceeds in the reduction immediately, by compreſſing the extremity of the penis, at the time he is endeavouring to advance the prepuce; if he does not, let him keep it ſuſpended, and attempt again, after having fomented, and uſed ſome emollient applications: but if, from the contraction below the *corona glandis*, there is ſo great a ſtricture as to threaten a gangrene, or even, if the penis is much inlarged by water in the *membrana reticularis*, forming tumours called *cryſtallines*, three or four ſmall inciſions muſt be made with the point of a lancet, into the ſtricture and *cryſtallines*, according to the direction of the penis; which in the firſt caſe will ſet free the obſtruction, and in the other evacuate the water: the manner of dreſſing afterwards muſt be with fomentations, digeſtives, and the *theriaca Londinenſis* over the pledgits.

Of the PARACENTESIS.

THIS operation is an opening made into the abdomen, in order to empty any quantity of extravaſated water, collected in that ſpecies of dropſy called the *aſcites*; but as there is much more difficulty in learning when to perform than how to perform it, and indeed in ſome inſtances requires the niceſt judgment, we ſhall endeavour to ſpecify the diſtinctions which render the undertaking more or leſs proper.

There are but two kinds of dropſy: the *anaſarca*, called alſo *leucophlegmacy*, when the extravaſated water ſwims in the cells of the *membrana adipoſa*; and the *aſcites*, when the water poſſeſſes the cavity of the abdomen. In the firſt kind, the water is clear and limpid; but in the ſecond, a little groſſer, very often gelatinous and corrupted, and ſometimes even mixed with fleſhy concretions.

The operation of tapping is ſeldom the cure of the diſtemper: but dropſies, which are the conſequence of a mere impoveriſhment of the blood, are leſs likely to return than thoſe which are owing to any previous diſorder of the liver; and it is not uncommon for dropſies that follow agues, hæmorrhages, and diarrhœas, to do well; whereas in ſuch as are complicated with a ſcirrhous liver, there is hardly an example of a cure.

The water floating in the belly, is, by its fluctuation, to determine whether the operation be adviſeable; for if, by laying one hand on any part of the abdomen, you cannot feel an undulation from ſtriking on an oppoſite part with the other, it is to be preſumed there will be ſome obſtacle to the evacuation. It ſometimes happens, that a great quantity, or almoſt all the water, is contained in little bladders, adhering to the liver and the ſurface of the *peritonæum*, known by the name of *hydatids*; and the reſt of it is different ſized ones, from the degree of a *hydatid*, to the ſize of a globe holding half a pint or a pint of water. This is called the encyſted dropſy, and from the ſmalleſs of its cyſts makes the operation uſeleſs; but is not difficult to be diſtinguiſhed, becauſe there is not a fluctuation of the water, unleſs it is complicated with an extravaſation.

When the fluctuation is hardly perceptible, (except the teguments of the abdomen are very much thickened by an *anaſarca*,) in all probability the fluid is gelatinous.

There is another kind of dropſy, which for the moſt part forbids the operation, and is peculiar to women, being ſeated in the body of one or both ovaries. There is no example of this ſpecies but what may be known by the hardneſs and irregularity of the tumour of the abdomen, which is nearly uniform in the other caſes.

When the ovary is dropſical, the water is generally depoſited in a great number of cells formed in the body of it; which circumſtance makes the fluctuation inſenſible, and the perforation uſeleſs: though ſometimes there are only one or

two

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two cells; in which caſe, if the ovary is greatly magnified, the undulation will be readily felt, and the operation be adviſeable.

When the *aſcites* and *anaſarca* are complicated, it is ſeldom proper to perform the operation, ſince the water may be much more effectually evacuated by ſcarifications in the legs than by tapping.

Upon the ſuppoſition nothing forbids the extraction of the water, the manner of operating is this: Having placed the patient in a chair of a convenient height, let him join his hands ſo as to preſs upon his ſtomach; then dipping the trocar in oil, you ſtab it ſuddenly through the tegument, and, withdrawing the perforator, leave the waters to empty by the canula: the *abdomen* being, when filled, in the circumſtance of a bladder diſtended with a fluid, would make it indifferent where to wound; but the apprehenſion of hurting the liver, if it be much enlarged, has induced operators rather to chuſe the left ſide, and generally in that part which is about three inches obliquely below the navel: if the navel protuberates, you may make a ſmall puncture with a lancet through the ſkin, and the waters will be readily voided by that orifice, without any danger of a *hernia* ſucceeding: but it ſhould be carefully attended to, whether the protuberance is formed by the water or an *exomphalos*; in which latter caſe, the inteſtine would be wounded, and not without the greateſt danger. The ſurgeon neither in opening with the lancet, nor perforating with the trocar, need fear injuring the inteſtines, unleſs there is but little water in the *abdomen*, ſince they are too much confined by the meſentery to come within reach of danger from theſe inſtruments; but it ſometimes happens, that when the water is almoſt all emptied, it is ſuddenly ſtopped by the inteſtine or *omentum* preſſing againſt the end of the canula; in which caſe you may puſh them away with a probe: during the evacuation, your aſſiſtants muſt keep preſſing on each ſide of the *abdomen*, with a force equal to that of the waters before contained there; for by neglecting this rule, the patient will be apt to fall into faintings, from the weight on the great veſſels of the *abdomen* being taken off, and the ſinking of the diaphragm ſucceeding; in conſequence of which, more blood flowing into the inferior veſſels than uſual, leaves the ſuperior ones of a ſudden too empty, and thus interrupts the regular progreſs of the circulation. To obviate this inconvenience, the compreſſion muſt not only be made with the hands during the operation, but be afterwards continued, by ſwathing the *abdomen* with a roller of flannel, about eight yards long, and five inches broad, beginning at the bottom of the belly, ſo that the inteſtines may be borne up againſt the diaphragm: you may change the roller every day till the third or fourth day, by which time the ſeveral parts will have acquired their due tone. For the dreſſing, a piece of dry lint and plaiſter ſuffice; but between the ſkin and roller it may be proper to lay a double flannel a foot ſquare, dipt in brandy or ſpirits of wine.

This operation, though it does not often abſolutely cure, yet it ſometimes preſerves life a great many years, and even a pleaſant one, eſpecially if the waters have been long collecting.

Explanation of Fig. 3. Plate CLVII.

A, A trocar of the moſt convenient ſize for emptying the *abdomen* when the water is not gelatinous. It is here repreſented with the perforator in the canula, juſt as it is placed when we perform the operation.

B, The canula of a large trocar, recommended in caſes where the water is gelatinous.

C, The perforator of the large trocar.

The handle of the trocar is generally made of wood, the canula of ſilver, and the perforator of ſteel. Great care ſhould be taken by the makers of this inſtrument, that the perforator ſhould exactly fill up the cavity of the canula; for unleſs the extremity of the canula lies quite cloſe and ſmooth on the perforator, the introduction of it into the *abdomen* will be very painful. To make it ſlip in more eaſily, the edge of the extremity of the canula ſhould be thin and ſharp; and that the canula ſhould be of ſteel; for the ſilver one being of too ſoft a metal, becomes jagged or bruiſed at its extremity with very little uſe.

Of the Fistula in Ano.

The *fiſtula in ano* is an abſceſs running upon or into the *inteſtinum rectum*.

The piles, which are little tumours formed about the verge of the *anus*, immediately within the *membrana interna* of the *rectum*, do ſometimes ſuppurate, and become the fore-runners of a large abſceſs; alſo external injuries here, as in every other part of the body, may produce it; but from whatever cauſe the abſceſs ariſe, the manner of operating upon it will be according to the nature and direction of its cavity.

If the ſurgeon have the firſt management of the abſceſs, and there appear an external inflammation upon one ſide of the buttock only; after having waited for the proper maturity, let him with a knife make an inciſion the whole length of it; and in all probability, even though the bladder be affected, the largeneſs of the wound, and the proper application of doſſils lightly preſſed in, will prevent the putrefaction of the inteſtine, and make the cavity fill up like impoſthumations of other parts.

If the *ſinus* be continued to the other buttock, almoſt ſurrounding the inteſtine, the whole courſe of it muſt be dilated in like manner; ſince, in ſuch ſpungy cavities, a generation of fleſh cannot be procured but by large openings; whence alſo, if the ſkin is very thin, lying looſe and flabby over the *ſinus*, it is abſolutely neceſſary to cut it quite away, or the patient will be apt to ſink under the diſcharge, which, in the circumſtance here deſcribed, is ſometimes exceſſive. By this method, which cannot be too much recommended, it is amazing how happy the event is likely to be; whereas, from neglecting it, and truſting only to a narrow opening, if the diſcharge do not deſtroy the patient, at leaſt the matter, by being confined, corrupts the gut, and inſinuating itſelf about it, forms many other channels, which running in various directions often baffle an operator, and have been the cauſe of a fiſtula being ſo generally eſteemed very difficult of cure.

Here we have conſidered the impoſthumation as poſſeſſing a great part of the buttock; but it more frequently happens, that the matter points with a ſmall extent of inflammation on the ſkin, and the direction of the *ſinus* is even with the gut: in this caſe, having made a puncture, you may with a probe learn if it has penetrated into the inteſtine, by paſſing your finger up it, and feeling the probe introduced through the wound into its cavity; though, for the moſt part, it may be:

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be known by a diſcharge of matter from the *anus*. When this is the ſtate of the fiſtula, there is no heſitation to be made; but immediately putting one blade of the ſciſſars up the gut, and the other up the wound, ſnip the whole length of it. This proceſs is as adviſeable when the inteſtine is not perforated, if the *ſinus* is narrow, and runs upon or very near it; for if the abſceſs be tented, which is the only way of dreſſing it while the external orifice is ſmall, it will almoſt certainly grow callous; ſo that the ſureſt means of cure, will be opening the gut, that proper applications may be laid to the bottom of the wound. However, it ſhould be well attended to, that ſome *ſinuſes* pretty near the inteſtine neither run into nor upon it; in which caſe, they muſt be opened, according to the courſe of their penetration. There are abundance of inſtances, where the inteſtine is ſo much ulcerated, as to give free iſſue to the matter of the abſceſs by the *anus*: but there are none where there is not, by the thinneſs and diſcolouration of the ſkin, or an induration to be perceived through the ſkin, ſome mark of its direction; which, if diſcovered, may be opened into with a lancet, and then it becomes the ſame caſe as if the matter had fairly pointed.

If the *ſinuſes* into and about the gut are not complicated with an induration, and you can follow their courſe; the mere opening with ſciſſars, or a knife guided on a director, will ſometimes ſuffice; but it is generally ſafer to cut the piece of fleſh ſurrounded by theſe inciſions quite away, and, when it is callous, abſolutely neceſſary, or the calloſities muſt be waſted afterwards by eſcharotick medicines, which is a tedious and cruel method of cure.

When the fiſtula is of a long ſtanding, and we have choice of time for opening it, a doſe of rhubarb the day before the operation will be very convenient, as it not only will empty the bowels, but alſo prove an aſtringent for a while, and prevent the miſchief of removing the dreſſings in order to go to ſtool.

It ſometimes happens, that the orifices are ſo ſmall, as not to admit the entrance of the ſciſſars; in which caſe, ſponge tents muſt be employed for their dilatation.

In performing theſe operations on the *anus*, no inſtruments are ſo handy as the knife and ſciſſars; almoſt all the others which have been invented to facilitate the work are not only difficult to manage, but more painful to the patient: however, in thoſe inſtances where the fiſtula is very narrow, and opens into the inteſtines, juſt within the verge of the *anus*, the ſyringotomy may be uſed with advantage; but where the opening into the gut is high, it cannot be employed without giving great pain.

The worſt ſpecies of fiſtula is that communicating with the *urethra*, and ſometimes (through the proſtate gland) with the bladder itſelf. This generally takes it riſe from a former gonorrhœa, and appears externally firſt in *perineo*, and afterwards increaſing more towards the *anus*, and even ſometimes into the groin, burſts out in various orifices, through the ſkin, which ſoon becomes callous and rotten; and the urine paſſing partly through theſe orifices, will often excite as much pain, and of the ſame kind, as a ſtone in the bladder.

This ſpecies of fiſtula taking its riſe from ſtrictures of the urethra, is only manageable by the bougie: for ſo long as the *urethra* is obſtructed, the cure of the fiſtula will be imperfect; but if the canal be opened by this application, it is amazing what obſtinate indurations and foul *ſinuſes* will in conſequence diſappear; though there are ſome ſo callous and rotten, as to demand the knife and ſkilful dreſſings, notwithſtanding the *urethra* ſhould be dilated by the uſe of bougies.

Of the Puncture *of the* PERINEUM.

THIS operation is performed, when the bladder is under ſuch a ſuppreſſion of urine, as cannot be relieved by any gentler methods, nor, by reaſon of the obſtruction in its neck or the *urethra*, will admit of the introduction of a catheter. The manner of doing it, as deſcribed by moſt writers, is by puſhing a common trocar from the place where the external wound in the old way of cutting is made, into the cavity of the bladder, and ſo procuring the iſſue of the water through the canula; but others, refining upon this practice, have ordered an inciſion to be carried on from the ſame part into the bladder, and then to inſinuate the canula: but both the methods are to be rejected, in favour of an opening a little above the *os pubis*: for beſides that it is not eaſy to guide the inſtrument through the proſtate gland into the bladder, the neceſſity of continuing it, in a part already very much inflamed and thickened, ſeldom fails to do miſchief, and even to produce a mortification.

There is another method ſtill more eaſy both to the patient and the operator; which conſiſts only in emptying the bladder with a common trocar, and ſtopping the canula with a little cork, which is afterwards to be taken out as often as the patient has occaſion to urine. The canula is to be continued in the bladder, till ſuch time as the perſon finds he can void his urine by the natural paſſage.

In this operation the *abdomen* ought to be perforated about two inches above the *os pubis*; and if the patient be fat, the trocar ſhould penetrate two inches, otherwiſe an inch and a half will be ſufficient.

Of the STONE.

STONY concretions are a diſeaſe incident to ſeveral parts of the body; but we ſhall treat only of thoſe formed in the kidneys and bladder.

Small ſtones and gravel are frequently voided without pain: but ſometimes they collect and become very large in the kidneys; in which caſe, a fit of the ſtone in that part is the cure, from the inflammation and pain occaſioning convulſive twitches, which at laſt expel them. But in this diſeaſe the patient is very much relieved by ſeveral kinds of remedies, ſuch as the mucilaginous, the ſaponaceous, *&c.* ſome of which lubricate, and others both lubricate and ſtimulate. The ſand, in paſſing through the *ureters*, is very much forwarded by the force of the urine. The *uretets* being very narrow as they run over the *pſoas* muſcle, and alſo at their entrance into the bladder, make the movement of the ſtone very painful and difficult in thoſe parts; but there is ſeldom ſo much trouble after the firſt fit; for when once they have been dilated, they generally continue ſo. For the ſymptoms of a ſtone in the bladder, ſee MEDICINE, p. 122.

Of SEARCHING.

THE patient being laid on a horizontal table, with his thighs elevated and a little extended, paſs the ſound with the concave part towards you, until it meets with ſome reſiſtance *in perinæo*, a little above the anus; then turning it without much force, puſh it gently on into the bladder; and if

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if it meets with an obſtruction at the neck, raiſe its extremity upwards, by inclining the handle of it towards you; or if it doa't then ſlip in, withdraw it a quarter of an inch, and introducing your fore-finger into the *rectum*, liſt it up, and it will ſeldom fail to enter: there is ſome art in turning the ſound in the proper place of the *urethra*, which ſurgeons not verſed in this operation cannot ſo well execute; therefore they may paſs the inſtrument with the concave ſide always towards the *abdomen* of the patient, obſerving the ſame rule at the entrance into the bladder as in the other method. The cauſe of this obſtacle, beſides the *rugæ* of the *urethra*, and the reſiſtance of the *verumontanum*, is ſometimes a ſmall projection of the orifice of the bladder, in the *urethra*, like that of the *os tincæ* in the *vagina*, which occaſions the end of the ſound to ſlip a little beyond it.

Though, upon ſearching, we are aſſured of a ſtone in the bladder, we are not, without further inquiry, to operate immediately; ſince there are ſometimes obſtacles which forbid the operation, either abſolutely, or only for a certain time; among theſe, that of greateſt conſequence, is the gravel or ſtone in the kidneys. The objections of leſs weight, and which frequently are removed, are a fit of the ſtone, a cough, a hectic, and being emaciated by long pain; exceſſive hot or cold weather are likewiſe hindrances: But in extremity of danger, theſe laſt conſiderations may be diſregarded.

Difference of age makes an extreme difference of danger, infants and young people almoſt always recovering; but ſtill the operation is adviſeable on thoſe advanced in years, tho' it is not attended with near the ſame ſucceſs. This operation is performed four ſeveral ways, all which we ſhall deſcribe.

Of the Lesser Apparatus, *or Cutting on the* Gripe.

The moſt ancient way of cutting for the ſtone, is that deſcribed by *Celſus*, and known by the name of *cutting on the gripe*; though, ſince the time of *Johannes de Romanis*, it is alſo called *cutting with the leſſer apparatus*, to diſtinguiſh it from his new method, which, on account of the many inſtruments employed in it, is called *cutting with the greater apparatus*. The manner of doing the operation is this: You firſt introduce the fore finger and middle finger of the left hand, dipt in oil, up the *anus*, and preſſing ſoftly with your right hand above the *os pubis*, endeavour to bring the ſtone towards the neck of the bladder; then making an inciſion, on the left ſide of the *perinæum*, above the *anus*, directly upon the ſtone, you turn it out through the wound, either with your fingers or a ſcoop.

This way of cutting was attended with many difficulties, for want of proper inſtruments to direct the inciſion, and extract the ſtone, when it lay beyond the reach of the fingers, which in a large bladder was frequently the caſe.

The wound of the bladder in this operation is made in the ſame place as is now practiſed in the lateral method; but it being impracticable on ſome ſubjects, and uncertain on all others, has made it univerſally exploded.

Of the Greater Apparatus, *or the* Old way.

This method of cutting, invented by *Johannes de Romanis*, has at different times, and with different people, varied conſiderably in ſome of its proceſſes, and particularly with regard to the uſe of certain inſtruments. What we ſhall deſcribe, will be the manner in which it is now practiſed with all its improvements.

Having laid the patient on a ſquare horizontal table, three feet four inches high, with a pillow under his head, let his legs and thighs be bent, and his heels made to approach his buttocks, by tying his hands to the bottom of his feet, with a couple of ſtrong ligatures, about two yards long; and to ſecure him more effectually from ſtruggling, paſs a double ligature under one of his hams, and carry the four ſtrings round his neck to the other ham; then paſſing the loop underneath it, make a knot by threading one of the ſingle ends through the loop: After this, the thighs being widened from each other, and firmly ſupported by proper perſons, you introduce the ſtaff, having firſt dipt it in oil, which muſt be held by your aſſiſtant, a little leaning on the left ſide of the ſeam in *perinæo*; and beginning the external wound juſt below the *ſcrotum*, (which muſt be held out of the way,) you continue it downwards, to within two fingers breadth of the *anus*; then leaving that direction, you ſlip the knife forwards in the groove, pretty far into the bulbous part of the *urethra*; or, as there is ſome danger of wounding the *rectum*, in the continuation of the inciſion, you may turn the knife with the back towards it, and make this part of the inciſion from within outwards. Should a very large veſſel be cut, it will be adviſeable to tie it before you proceed any farther in the operation. When the wound is made, ſlide the gorget along the groove of the ſtaff into the bladder; and to do it with more ſafety, when the beak of it is received in the groove, it will be proper to take the ſtaff yourſelf in your hand: for if the aſſiſtant ſhould, unwarily, either incline the handle of it too much towards you, or not reſiſt enough to the force of the gorget, it is very apt to ſlip out of the groove, between the *rectum* and the bladder; which accident is not only inconvenient to the operator for the preſent, but is attended for the moſt part with very bad conſequences. The gorget being paſſed, dilate the *urethra* and neck of the bladder with your fore-finger, and introduce the forceps into the bladder, keeping them ſhut till you touch the ſtone, when you muſt graſp it with a moderate force, and extract it by pulling downwards towards the *rectum*. Should you find a difficulty in laying hold of the ſtone, be careful to keep your forceps in ſuch a poſition, that they may open upwards and downwards, (not laterally,) which will very much facilitate the embracing of the ſtone, in caſe it ſhould happen to be thin and flat.

Of the High Operation.

This method of cutting for the ſtone was firſt publiſhed in the year 1561, by *Pierre Franco*. About the year 1719, it was firſt done in *England* by Mr *Douglas*, and after him practiſed by others. The manner of performing it, with the improvements made ſince *Franco*'s operation, is this:

The patient being laid on a ſquare table, with his legs hanging over, and faſtened to the ſides of it by a ligature paſſed above the knee; his head and body lifted up a little by pillows, ſo as to relax the abdominal muſcles; and his hands held ſteady by ſome aſſiſtants; inject through a catheter into the bladder as much barley-water as he can bear, which in a man is often about eight ounces, and ſometimes, twelve. For the more eaſily doing this, an ox's *ureter* may be tied to the extremity of the ſyringe, and handle of the catheter,

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catheter, which being pliable will prevent any painful motion of the inſtrument in the bladder.

The bladder being filled, an aſſiſtant, in order to prevent the reflux of the water, muſt graſp the *penis* the moment the catheter is withdrawn, holding it on one ſide, in ſuch a manner as not to ſtretch the ſkin of the *abdomen*; then with a round edged knife make an inciſion about four inches long, between the *recti* and pyramidal muſcles, through the *membrana adipoſa*, as deep as the bladder, bringing its extremity almoſt down to the *penis*; after this, taking a crooked knife, continue the inciſion into the bladder, carrying it a little under the *os pubis*, and immediately upon the water's flowing out, introduce the fore-finger of your left hand, which will direct the forceps to the ſtone.

This method was at firſt received with great applauſe in London; but after ſome trial was rejected, for the following inconveniences.

It ſometimes happens that the bladder, notwithſtanding the injection, ſtill continues ſo deep under the *os pubis*, that the *peritonæum* being neceſſarily wounded firſt, the inteſtines puſh out immediately at the orifice, and the urine afterwards empties into the *abdomen*; in which caſe, hardly any recover. The injection itſelf is exceedingly painful; and however ſlowly the fluid be injected, it diſtends the bladder ſo much more ſuddenly than the urine from the kidneys does, and ſo much faſter than it can well bear, that it not only is ſeldom dilated enough to make the operation abſolutely ſecure, but is ſometimes even burſt, or at leaſt its tone deſtroyed by the haſty dilatation. What adds to the danger here, is the poſſibility of meeting with a contracted indurated bladder; which is a circumſtance ſometimes attending on the ſtone, and indeed an exceedingly dangerous one in all the other methods; but would be frightful in this, by reaſon not only of the neceſſity of wounding the *peritonæum*, but of the difficulty of coming at the ſtone. If the ſtone be very ſmall, it is hard to lay hold of it with the forceps, and in a fat man the fingers are not long enough for that purpoſe. If there are many little ſtones, it will ſcarce happen that more than one at a time can be extracted; and if the ſtone breaks, it not only is impracticable to take it all away in the operation, but alſo, from the ſupine poſture of the patient, it will generally remain in the bladder; whereas, in the other methods, for the moſt part, it works itſelf out with the urine. But even ſuppoſing that the operation itſelf is proſperous, the conſequences generally are very troubleſome; for the urine iſſuing out at an orifice where there is no deſcent, ſpreads itſelf upon the *abdomen*, and makes very painful excoriations; though, what is ſtill worſe, it ſometimes inſinuates itſelf into the cells between the bladder and *abdominal* muſcles, and, together with the inflammation excited by the operation, brings on a ſuppuration there, which is always difficult to manage, and frequently mortal.

Of the LATERAL OPERATION.

THIS method was invented by an eccleſiaſtic, who called himſelf *Frere Jaques*. He came to Paris in the year 1697, bringing with him an abundance of certificates of his dexterity in opening; and making his hiſtory known to the court, and magiſtrates of the city, he got an order to cut at the *Hotel Dieu*, and the *Charité*, where he performed this operation on about fifty perſons. His ſucceſs did not anſwer the promiſes he had made.

The principal defect in his manner of cutting was the want of a groove in his ſtaff: which made it difficult to carry the knife exactly into the bladder; nor did he take any care of his patients after the operation; ſo that for want of proper dreſſings, ſome of the wounds proved fiſtulous, and other ill conſequences enſued.

Cheſelden, improving Frere Jacquer's method, made uſe of the following, which is now the practice of moſt operators.

The patient being laid on a table, with his hands and feet tied, and the ſtaff paſſed as in the old way, let your aſſiſtant hold it a little ſlanting on one ſide, ſo that the direction of it may run exactly through the middle of the left *erector penis* and *accelerator urinæ* muſcles; then make your inciſion through the ſkin and fat, very large, beginning on one ſide of the ſeam in *perinæo*, a little above the place wounded in the old way, and finiſhing a little below the anus, between it and the tuberoſity of the iſchium: this wound muſt be carried on deeper between the muſcles, until the proſtate be felt; when, ſearching for the ſtaff, and fixing it properly, if it has ſlipt, you muſt turn the edge of the knife upwards, and cut the whole length of that gland from within outwards, at the ſame time puſhing down the rectum with a finger or two of the left hand; by which precautions the gut will alway eſcape wounding; after which, the operation finiſhes nearly in the ſame manner as with the greater apparatus.

If, upon introducing the forceps, you do not perceive the ſtone readily, you muſt lift up their handle, and feel almoſt perpendicularly for it; ſince for the moſt part, when it is hard to come at, it lies in one of the ſinuſes ſometimes formed on each ſide of the neck of the bladder, which project forward in ſuch a manner, that if the ſtone lie there, the forceps paſs beyond it the moment they are through the wound; ſo that it would be impoſſible to lay hold of it, or even to feel it, if not aware of this circumſtance.

When the ſtone breaks, it is much ſafer to take away the fragments with the forceps, than to leave them be diſcharged with the urine; and if the pieces are very ſmall, like ſand, a ſcoop is the beſt inſtrument; though ſome prefer the injecting barley-water into the bladder, which ſuddenly returning, brings away the broken particles of the ſtone.

As there are hardly any inſtances of more ſtones than one, when the ſtone taken away is rough; ſo when it is ſmooth and poliſhed in any part of it, it is almoſt a certain ſign of others behind; on which account, an operator ſhould be careful, in that caſe, to examine not only with his fingers, but ſome convenient inſtrument, for the remaining ones; though indeed, in all caſes, it may be proper to examine the bladder after the extraction of a ſtone; becauſe it is poſſible there may be a ſecond ſtone, notwithſtanding the firſt be rough.

The great inconvenience of the lateral operation is the hæmorrhage which ſometimes enſues in men; for in children the danger of it is not worth mentioning.

If in the operation any very large veſſel of the external wound ſhould be divided, it is adviſeable to tie it before the extraction of the ſtone; but the neceſſity of doing this, does not occur once in twenty times.

There is but one objection more of any conſequence, which is the danger of wounding the rectum; and this is a very troubleſome accident: But if the operator obſerves the rule laid down with regard to that article, it might always be avoided.

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In this method the remarkable parts wounded by the knife are, the *muſculus tranſverſalis penis*, *levator ani*, and *proſtate gland*: In the old way, the urethra only is wounded, about two inches on this ſide the proſtate, and the inſtruments are forced through the reſt of the paſſage, which is compoſed of the bulbous part of the urethra, the membranous part of the urethra, the neck of the bladder, and proſtate gland. This channel is ſo very narrow, that, till it be torn to pieces, the management of the forceps is exceedingly difficult; and it happens frequently, that from the tender texture of the membranous parts, the forceps are unwarily puſhed through it between the *os pubis* and bladder; beſides that in introducing the gorget upon the ſtaff, it is apt to ſlip downwards between the rectum and bladder, both which inconveniencies are avoided in the lateral operation. It is true, the wound made in the lateral method will not admit of the extraction of a large ſtone without laceration as well as in the old way: but in the one caſe, the laceration is ſmall, and made after a preparation for it by an inciſion; and in the other, all the parts are torn without any previous opening, and which are ſo very tight, that the pain of the diſtenſion muſt neceſſarily be exceſſive. However, in both theſe operations, the ſurgeon muſt not graſp the ſtone with violence; and even in extracting, muſt, with both hands to the branches of his forceps, reſiſt their ſhutting ſo tight, as the compreſſion from the lips of ſuch a narrow wound would otherwiſe make them. The extraction of very large ſtones is much more impracticable with the greater apparatus than by this method, becauſe of the ſmallneſs of the angle of the bones in that part where the wound is made; ſo that indeed it is neceſſary in almoſt all extractions to pull the ſtone downward towards the rectum, which cannot be done without great violence to the membranous parts, and even the ſeparation of one from another; whence follow abſceſſes and ſloughs about the wound, which is a circumſtance not known in the lateral operation. *Ecchymoſes* followed by ſuppuration and gangrene, ſometimes ſpread themſelves upon the ſcrotum; and in ſhort, all the inconveniences and ill ſymptoms which attend upon the lateral operation, except the hæmorrhage, are in a more violent degree incident to the old way.

An incontinence of urine is not common after the lateral operation, and a fiſtula ſeldom or never the conſequence of it.

The manner of treating the patient after the operation, is pretty nearly this: If it happens that the veſſels of the proſtate bleed, dry lint, or lint dipped in ſome ſtyptick water, ſuch as *aqua vitrioli*, muſt be applied to the part, and held there with a conſiderable degree of preſſure for a few hours; or a ſilver canula of three or four inches long, covered with fine rag, may be introduced into the bladder, and left there two or three days, which ſeldom fails to ſtop the hæmorrhage. The patient may alſo take an opiate. If the wound does not bleed, a little dry lint, or a pledgit of digeſtive laid gently in it, is beſt. The place where the patient lies, ſhould be moderately cool, as heat not only diſpoſes the veſſels to bleed afreſh, but generally makes him low and faint. If, ſoon after the operation, he complains of a ſickneſs at the ſtomach, or even a pain in that part of the abdomen near the bladder, it is not always a ſign of a dangerous inflammation, but frequently goes off in half an hour: to aſſiſt, however, in its removal, a fomentation put into an hog's bladder, and applied pretty warm to the part in pain, will be of great ſervice: if the pain increaſes, after two or three hours, the conſequence is much to be feared; and in this caſe, bleeding, and emollient clyſters by way of fomentation to the bowels, are immediately neceſſary.

The firſt good ſymptom after the operation is the urine coming freely away, as we then know the lips of the bladder and proſtate gland are not much inflamed. If the patient ſhould become languid, and continue without any appetite, bliſters prove beneficial; which may be applied with great ſafety, and little pain, as there is ſeldom or never any ſtrangury. About the third or fourth day a ſtool muſt be procured by a clyſter; for it ſeldom comes naturally the firſt time, and this method muſt be continued as every man's diſcretion ſhall guide him. As ſoon as the patient comes to an appetite, he ſhould be indulged in eating light food; with this caution, that he do not eat too much at a time.

If, during the cure, the buttocks ſhould be excoriated by the urine, let them be anointed with nutritum: the dreſſing from firſt to laſt is ſeldom any other than a ſoft digeſtive, or dry lint.

Of the STONE *in the* URETHRA.

IF a ſmall ſtone be lodged in the urethra near the glans, it may often be puſhed out with the fingers, or picked away with ſome inſtrument; but if it ſtops in any other part of the channel, it may be cut upon without any inconvenience. The beſt way of doing it, is to pull the prepuce over the glans, as far as you can; and then making an inciſion the length of the ſtone, through the teguments, it may be turned out with a little hook or the point of a probe: The wound of the ſkin ſlipping back afterwards, to its proper ſituation, and from the orifice of the urethra, prevents the iſſue of the urine through that orifice, and very often heals in twenty-four hours. This is a much leſs painful method of extracting ſtones from the urethra, than by any inſtruments that have hitherto been deviſed.

Of the extraction of the Stone *in* WOMEN.

THE extraction of the ſtone in women, will eaſily be underſtood, ſince the whole operation conſiſts in placing them in the ſame manner as men, and, without making any wound, introducing into the bladder a ſtraight director, upon that a gorget, and afterwards the forceps to take hold of the ſtone; all which may be done without difficulty, by reaſon of the ſhortneſs of the urethra. If the ſtone proves very large, and in extracting draws the bladder forwards, it is adviſeable to make an inciſion through the neck of it, upon the ſtone; which not only will facilitate the extraction, but alſo be leſs dangerous than a laceration which will neceſſarily follow. The dreſſings are fomentations and emollient ointments, which ſhould be applied two or three times a day, and the patient in other reſpects be treated like men who have undergone the operation for the ſtone.

EXPLANATION of Fig. 4. Plate CLVII.

A, A ſound uſed in ſearching for the ſtone.

The ſize repreſented here is but a little too large for the youngeſt children, and may be uſed upon boys till they are thirteen or fourteen years of age; a larger ſhould be employed between that age and adultneſs, when one of about ten inches, in a right line from the handle to the extremity, is proper. This ſhould be made of ſteel, and its extremity be round and ſmooth.

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B, A ſtaff fit for the operation on boys from eight to fourteen years of age. The ſtaff for a man muſt be of the ſize of the ſound already deſcribed.

C, A ſtaff ſomething too big for the ſmalleſt children, but may be uſed upon boys from about four years of age to eight.

The ſtaff has a groove on its convex ſide, which firſt ſerves as a direction where to cut, and afterwards receiving the beak of the gorget, guides it readily to the bladder. Care ſhould be taken, in making the groove, that the edges of it be ſmoothed down, ſo that they cannot wound in paſſing through the urethra. The extremity ſhould alſo be open; otherwiſe it will be ſometimes difficult to withdraw the ſtaff, when the gorget is introduced, and preſſes againſt the end of it.

Theſe inſtruments are uſually made with a greater bending than here repreſented; but this ſhape is more like to that of the urethra, and rather more advantageous for making the inciſion.

D, the yoke, an inſtrument to be worn by men with an incontinence of urine. It is made with iron, but for uſe muſt be covered with velvet. It moves upon a joint at one end, and is faſtened at the other by catches at different diſtances placed on a ſpring. It muſt be accommodated to the ſize of the penis, and be taken off whenever the patient finds an inclination to make water. This inſtrument is exceedingly uſeful, becauſe it always anſwers the purpoſe, and ſeldom galls the part after a few days wearing.

EXPLANATION of Fig. 5. Plate CLVII.

A, A ſmall catheter made of ſilver. This inſtrument is hollow, and ſerves to draw off the urine when under a ſuppreſſion. It is alſo uſed in the high operation to fill the bladder with water. Near its extremity, are two orifices, through which the water paſſes into its cavity. Care ſhould be taken that the edges of theſe orifices are quite ſmooth.

B, The knife uſed in cutting for the ſtone: it is the ſame already deſcribed; but it is not improper to repeat the figure with the alteration of a quantity of tow twiſted round it, which makes it eaſier to hold, when we perform the lateral operation, and turn the edge upwards to wound the proſtate gland.

C, A female catheter, differing from the male catheter, it being almoſt ſtraight; and ſomething larger.

D, A ſilver-wire to paſs into either catheter, for the removing any grumous blood or matter that clogs them up.

EXPLANATION of Fig. 6. Plate CLVII.

A, The gorget uſed upon men in the lateral operation.

B, The gorget uſed upon children under five years of age in the lateral operation.

A gorget between the ſizes of theſe two will be fit for boys from five years of age to fifteen or ſixteen.

Theſe inſtruments are hollow for the paſſage of the forceps into the bladder; and their handles lie ſlanting, that they may the more readily be carrried through the wound of the proſtate, which is made obliquely on the left ſide of it. The beak at the extremity of the gorget muſt be ſmaller than the groove of the ſtaff which is cut upon, becauſe it is to be received in the groove. Care ſhould be taken, that the edges of the gorget near the beak are not ſharp, leaſt, inſtead of dilating the wound, as it ought, it ſhould only cut on each ſide when introduced; in which caſe, it would be difficult to carry the forceps into the bladder.

C, A gorget, with its handle exactly in the middle; this ſhaped inſtrument is uſed in the old way. All the gorgets ſhould be made of ſteel.

EXPLANATION of Fig. 7. Plate CLVII.

A, The forceps for extracting the ſtone. Theſe are repreſented a little open, that the teeth may be better ſeen within-ſide.

This inſtrument muſt be of different ſizes for different ages and ſtones, from the length of four inches to one of near a foot long; but the forceps of about eight inches long will be found moſt generally uſeful. The number neceſſary to be furniſhed with, will be four or five.

Great care ſhould be taken by the makers of this inſtrument, that it move eaſily upon the rivet; that the extremity of the chops do not meet when they are ſhut; and particularly that the teeth be not too large, leſt, in entering deep into the ſtone, they ſhould break it. It is of conſequence alſo that the teeth do not reach farther towards the joint than here repreſented, becauſe a ſmall ſtone, when received into that part, being held faſt there, would dilate the forceps exceſſively, and make the extraction difficult; on which account, the inſide of the blades near the joint ſhould be ſmooth, that the ſtone may ſlip towards the teeth.

B, A director made of ſteel, uſed for the direction of the gorget, in the extraction of the ſtone from women.

C, A ſcoop to take away the ſtone when it is broken into ſmall pieces like ſand. This inſtrument is made of ſteel.

Of the EMPYEMA.

THE operation for the empyema generally implies an artificial opening made into the cavity of the thorax, by which we evacuate any fluid that lies there extravaſated, and is become dangerous by its weight and quantity. The fluids deſcribed as neceſſary to be voided by this operation, are blood, matter, and water.

When blood is the fluid, ſuppoſed to require evacuation by this method, it is always extravaſated through ſome wound of the veſſels of the lungs or thorax, and being diſcharged in great quantities on the diaphragm, is ſaid to oppreſs reſpiration, till let out by ſome convenient opening made in the moſt depending part of that cavity, which is the only kind of perforation into the thorax diſtinguiſhed by the name of the operation for the *empyema*: But though this opening is univerſally recommended in the caſe here ſtated, yet we meet with few or no examples where it has been practiſed for a mere extravaſation of blood.

To empty the thorax, in a rupture of any veſſels which open into it, bleeding is very neceſſary; which not only ſtops the hæmorrhage, by abating the force of the circulation; but likewiſe, by unloading the veſſels of their contents, makes them more fit to receive the extravaſated fluid by abſorption; gentle evacuations and pectorals are alſo very ſerviceable, and a low diet is abſolutely neceſſary.

The ſecond circumſtance in which this operation takes place, is a rupture of matter from the *pleura mediaſtinum* or lungs into the cavity of the thorax, where accumulating it at length proves fatal for want of a diſcharge. It is true, that the caſe occurs but very ſeldom, where the operation is neceſſary; becauſe, in moſt abſceſſes of the thorax, the matter

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matter is uſually ſpit up as faſt as it is generated; and in the diſſection of ſuch who have died of this ſpecies of conſumption, we rarely find much extravaſated *pus* in the cavity, though a great portion of the lungs be deſtroyed. However, there are a few examples which require the operation: and theſe may be diſtinguiſhed by the following ſymptoms. The patient is obliged to lie upon the diſeaſed ſide, or, in caſe there is matter in both cavities of the thorax, on his back; becauſe the *mediaſtinum* can ſeldom ſupport the weight of the incumbent fluid, without ſuffering great pain; but this rule is not certain, it ſometimes happening that the patient can lie with eaſe on that ſide where there is no fluid. Another ſymptom of extravaſated matter, is an evident undulation of it, ſo that in certain motions it may be heard to quaſh. For the moſt part too, upon careful inquiry, an *œdema*, or at leaſt a thickening of ſome portion of the intercoſtal muſcles, will be diſcovered. And laſtly, if there be much fluid, it will be attended with a preternatural expanſion of that ſide of the cheſt where it lies. When therefore theſe ſigns appear after a previous pleuritic or pulmonary diſorder, and the caſe has been attended with the ſymptoms of a ſuppuration, it is moſt probably owing to a collection of matter; though the patient will alſo labour under a continual low fever, and a particular anxiety from the load of fluid.

The laſt ſort of fluid ſaid to require iſſue from this operation is water, which however very ſeldom collects in ſuch manner as to become the proper ſubject of the operation: for if the dropſy of the thorax be complicated with an *anaſarca*, or even *aſcites*, it is certainly improper; and indeed it hardly ever takes place, but where the diſtemper is ſingle, and takes its riſe from the ſame ſort of diſorders in the lymphatics of the pleura, as the hydrocele does from thoſe of the *tunica vaginalis*. The ſymptoms of this dropſy are, a ſmall cough without ſpitting, a little ſlow fever from the diſturbance of reſpiration; ſometimes too the water, by a ſudden jerk, may be heard to quaſh; and, generally ſpeaking, its weight upon the *diaphragm* and *mediaſtinum* are ſo troubleſome as to oblige the patient to ſtoop forward, and to turn upon the affected ſide when he lies down; for the ſame reaſon, when there is water in both cavities of the thorax, he is forced to lie on his back.

The manner of operating, whether it be for the diſcharge of matter or water, is to pitch upon the moſt depending part of the thorax, which ſome have ſuppoſed to be between the eighth and ninth rib, and others between the ninth and tenth, at ſuch a diſtance from the *vertebræ* that the depth of the fleſh may not be an impediment to the perforation. This diſtance is determined to be about a hand's breadth: and here, with a knife, ſciſſars, or trocar, we are ordered to make the perforation; but in doing it there are a great many difficulties. In fat perſons, it is not eaſy to count the ribs, and the wound will be very deep, and troubleſome to make; it is hardly poſſible to eſcape wounding the intercoſtal artery, which runs in this place between the ribs. But if the only advantage propoſed by the ſituation of the wound be derived from its dependency, the purpoſe of diſcharging the fluid will be as well anſwered by an opening between the ſixth and ſeventh rib, half way from the ſternum towards the ſpine; which, by laying ourſelves down, becomes in effect as depending an orifice, as the other in ſitting up; and by an opening made in this manner we avoid all the inconveniencies in the other method: For in this part of the thorax there is very little depth of muſcles; the artery lies concealed under the rib; and the diaphragm is at great diſtance. The opening is beſt made with a knife, and ſhould be about an inch long through the ſkin, and half an inch through the ſubjacent muſcles; though, to make the incision with leſs riſk of wounding the lungs, it may be adviſeable to dilate it with the blunt-pointed knife (as is practiſed in the operation for the *bubonocele*) after having made a ſmall puncture with a common knife. The treatment of the wound will be according to the nature of the diſcharge. If, after a few days, there appears no drain, you may let the orifice heal up; but if it continues, it may be kept open with a ſhort ſilver canula, until ſuch time as an alteration in that circumſtance will give us leave to cicatrize with ſafety.

Of Encyſted Tumours.

Theſe tumours borrow their names from a cyſt or bag, in which they are contained; and are farther diſtinguiſhed by the nature of their contents: If the matter forming them reſembles milk-curds, the tumour is called *atheroma*; if it be like honey, *meliceris*; and if compoſed of fat, or a ſuety ſubſtance, *ſteatoma*. The two firſt are not readily diſtinguiſhed from one another, but their difference from the *ſteatoma* is eaſily learnt by their ſoftneſs and fluctuation. Theſe tumours appear in every part of the body, and in places where there are no glands.

The *ſteatoma* is never painful until by its weight it grows troubleſome, nor is it a mark of general indiſpoſition of body; ſo that the extirpation ſeldoms fails of ſucceſs. The ſize of ſome of them is very large, frequently weighing five or ſix pounds, and there have been inſtances of their weighing above forty.

When the *ſteatoma* is irregular in its ſurface, with eminencies and depreſſions, it is ſuety; whereas the fat one has for the moſt part a uniform ſmooth outſide. The operation for the *ſteatoma* will be underſtood by the deſcription of that for the ſchirrhus.

The *atheroma* is much more common than the meliceris; at leaſt, if all encyſted tumours with matter not curdled, may, in compliance with cuſtom, be called ſo: Theſe are more frequent, and grow larger than thoſe where the matter is curdled, being often attendant on ſcrophulous indiſpoſitions, which makes them more difficult of cure.

The cyſts of theſe tumours, with the ſkin covering them, after a certain period of growth, reſiſting any further enlargement, do frequently inflame and break: but this opening is not ſo advantageous for the cure as extirpation by the knife, which ſhould be done in the infancy of the ſwelling. When the tumours are no bigger than a ſmall golden pippen, they may be diſſected away from under the ſkin, by making a ſtraight inciſion only through it; but if they exceed this bulk, an oval piece of ſkin muſt be cut through firſt, to make room for the management of the knife and taking away the tumour; in which caſe, it will be adviſeable to take off the upper portion of the cyſt with the ſkin; and then, by the help of a hook, to diſſect away as much of the remainder of it as can be conveniently, which is a leſs painful and more ſecure method than deſtroying it afterwards with eſcharoticks. This rule is to be obſerved, when the cyſt runs ſo deep amongſt the interſtices of the muſcles, as to make it impoſſible to remove the whole of it, where, if we cut off a great quantity, the reſt uſually comes away in ſloughs and matter.

The ganglion of the tendon is an encyſted tumour of the meliceris

meliceris kind, but its fluid is generally like the white of an egg; when it is ſmall, it ſometimes diſperſes of itſelf; preſſure and ſudden blows do alſo remove it; but for the moſt part it continues, unleſs it be extirpated. It is no uncommon caſe to meet with this ſpecies of ganglion, running under the *ligamentum carpale*, and extending itſelf both up the wriſt and down to the palm of the hand. The cure of this diſorder cannot be effected but by an inciſion through its whole length and dividing the *ligamentum carpale*.

The dreſſing in theſe caſes does not at all differ from the general methods of treating wounds.

Of the Amputation of the Cancered and Scirrhous Breast.

The ſucceſs of this operation is exceedingly precarious, from the great diſpoſition there is in the conſtitution, after an amputation, to form a new cancer in the wound, or ſome other part of the body. When a ſcirrhus has admitted of a long delay before the operation, the patient ſeems to have a better proſpect of cure without danger of a relapſe, than when it has increaſed very faſt, and with acute pain.

The ſcirrhus may be diſtinguiſhed, by its want of inflammation in the ſkin, its ſmoothneſs and ſlipperineſs deep in the breaſt, and generallyby its pricking pain, which as it is more or leſs, increaſes the danger accordingly; though there are ſome few with little or none in the beginning: as the tumour degenerates into a cancer, which is the worſt degree of ſcirrhus, it becomes unequal and livid, and the veſſels growing varicous, at laſt ulcerates.

In extirpating the ſcirrhus, if it be ſmall, a longitudinal inciſion will dilate ſufficiently for the operation; but if too large to be diſſected out in that manner. an oval piece of ſkin muſt be cut through firſt, the ſize of which is to be proportioned to that of the tumour; for example, if the ſwelling is five inches long, and three broad, the oval piece of ſkin cut away muſt be nearly of the ſame length, and about an inch and a half in breadth. In taking off the whole breaſt, the ſkin may be very much preſerved, by making the wound of it a great deal leſs than the baſis of the breaſt, which muſt be carefully cleared away from the pectoral muſcle. This is not difficult to do, becauſe all theſe ſcirrhuſes being enlarged glands, are encompaſſed with their proper membranes, which make them quite diſtinct from the neighbouring parts, and eaſily ſeparable; at leaſt this is the caſe when the tumour is moveable; for ſometimes it adheres to the ſubjacent muſcle, and that muſcle to the ribs; in which circumſtance, the operation is impracticable. When it is attended with knots in the arm pit, no ſervice can be done by amputation, unleſs the knots be taken away; for there is no ſort of dependence to be laid on their ſubſiding, by the diſcharge of the wound of the breaſt.

The bleeding of the large arteries is to be ſtopped by paſſing the needle twice through the fleſh, almoſt round every veſſel, and tying upon it, which will neceſſarily include it in the ligature. In order to diſcover the orifices of the veſſels, the wound muſt be cleaned with a ſponge wrung out of warm water.

The ſcirrhous tumours which appear about the lower jaw, are, generally ſpeaking, ſcrophulous diſorders, that diſtinguiſh themſelves almoſt by the circumſtance of fixing on the ſalivary glands. Theſe are very ſtubborn of cure, but not ſo bad as the ſcirrhus, ſince they frequently ſuppurate, and heal afterwards: if they impoſthumate again after healing, it is for want of a good bottom, which may ſometimes be procured by deſtroying their bad ſurface with a cauſtick. Beſides theſe, there is another ſpecies of ſcirrhus in the neck, that ſucceeds better after extirpation than either of the former kind; this is an enlargement of the lymphatick glands, which run cloſe up by the jugular vein, and is diſtinguiſhable from the cancers of this part, by its moveableneſs, want of pain, the laxneſs of the ſkin covering it, the ſmall degree of preſſure it makes on the *œſophagus* and *trachea*, and laſtly the good habit of body, as it ſeldom affects the conſtitution, which cancers here do very early, after their firſt appearance. This tumour, from its ſituation, requires great exactneſs in the cutting off: they ſometimes extend up to the chin towards the mouth, and occaſion a diviſion of the ſalivary duct in operating, which proves very troubleſome to heal; but, when all other methods have failed, may be cured by a perforation into the mouth, through that part of the cheek where it is wounded, which by a tent or ſmall ſeton may be made fiſtulous; then, by properly dreſſing upon the outſide, the oozing of the *ſaliva* that way will be prevented, and the external orifice healed without difficulty.

The treatment of all theſe wounds may be with dry lint firſt, and afterwards as in common wounds.

Of the Operation *of the* Trepan.

The operation of the *trepan*, is the making one or more orifices through the ſcull, to admit an inſtrument for raiſing any pieces of bone that by violence are beaten inwards upon the brain, or to give iſſue to blood or matter lodged in any part within the *cranium*.

Fractures of the ſkull are at all times very dangerous, not in conſequence of the injury done to the *cranium* itſelf, but as the brain becomes affected either from the preſſure of the fractured bone, or that of the extravaſated blood and matter. If then the ſymptoms excited by a fracture do ſometimes follow from a mere extravaſation of blood, as is the caſe when the *cranium* is not beaten inwards, it muſt likewiſe happen that a rupture of the veſſels of this part, without a fracture, will alſo occaſion the ſame diſorders: For this reaſon, the operation may take place where the ſcull is not much offended, but only the veſſels of the *dura mater*, the *pia mater*, or the brain.

When the *cranium* is beaten inward, without any fracture, it is called a depreſſion; when very much broken, a fracture; or if broken and beat in alſo, a fracture with depreſſion; if it is only cracked without depreſſion, though properly a fracture, it is called a fiſſure; if none of theſe diſorders appear, where there is a ſuſpicion of them, the ſymptoms are imputed to a concuſſion of the brain. Theſe are the four diſtinctions in uſe, and which fully comprehend all the others.

The depreſſion of the *cranium* without a fracture can but ſeldom occur, and then it happens to children whoſe bones are more pliable and ſoft than thoſe of adults.

In blows of the *cranium*, requiring the uſe of the trepan, the marks of a fracture are generally very evident, ſince the ſcalp is often lacerated ſo much, as to expoſe it to our ſight: But if the wound of the ſcalp be ſo ſmall, as only to admit a probe, we muſt judge then by the feel of the ſurface of the bone, uſing the caution of not miſtaking a ſuture for a fracture.

If there be no wound of the ſcalp, you muſt preſs about the

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the head with your fingers, till the patient complains of ſome particular part, which in all likelihood is the place affected; and, if the ſcalp there be ſeparated from the *cranium*, is almoſt infallibly ſo. The ſymptoms of a fracture, are, a bleeding at the ears and noſe, a loſs of ſenſe, vomitings, drowſineſs, delirium, incontinence of urine and excrement; but what is moſt to be depended upon, is a depreſſion of the bone, or a roughneſs on its outſide; for all the other complaints not only happen to concuſſions, which do well without the application of a trepan, but likewiſe there are fractures not attended with any of them, or at leaſt in a ſlight degree; ſo that theſe ſymptoms alone, without examination of the part affected, are but an uncertain rule to go by.

In concuſſions without a fracture, that produce the ſymptoms here laid down, and do well afterwards, the veſſels of the brain and membranes are only inflamed and dilated; or if they are ruptured, they abſorb the extravaſated blood again; on which account, nature ſhould be aſſiſted by plentiful bleedings, clyſters, and other evacuations, and ſo in all fractures where the patient is not trepanned immediately: however, although people with violent concuſſions do ſometimes recover, it is ſo very ſeldom, that there can be no pretence, when they happen, for neglecting the trepan, but not being able to learn in what part the concuſſion is.

Writers diſpute very much about the poſſibility of the *contra fiſſure*, or a fiſſure occaſioned on the part of the head oppoſite to that on which the blow is given, or where the inner table is fractured while the outer one remains entire; but there are hiſtories of caſes, which, if fairly ſtated, make it unqueſtionable; and this is moſt certain, that if the complaint be at a diſtance from where the blow was received, there can be no danger in ſcalping, and applying the trepan to that part where the pain is.

When we are aſſured of a fracture or depreſſion, it is always adviſeable to trepan as ſoon as poſſible, in order to prevent the ſpreading of the abſceſs, which ſeldom fails to follow upon the rupture of the veſſels of the brain and membranes, and for the moſt part in a few days.

The manner of treating a fracture of the *cranium*, will be according to the nature of the fracture itſelf, and the injury of the ſcalp. If the wound of the head be torn into angles, perhaps cutting off the lacerated flaps will make room for the ſaw; if the bone be broken into ſeveral pieces, the pieces may be taken away with the forceps, or if ſome of the ſkull be alſo depreſſed, the removal of the pieces will, without perforating, make way for the elevator to raiſe the depreſſed part; but if the fracture be not complicated with a wound of the ſcalp, or the wound be too ſmall to admit of the operation, which ſeldom fails to be the caſe, then the fracture muſt be laid bare, by taking away a large piece of the ſcalp.

Before the application of the trepan, it is to be remembered there are certain places on the ſcull where it cannot be uſed with ſo much ſafety as on others; the whole length of the ſagittal ſuture, down to the noſe, is always mentioned as one where the perforation is dangerous, becauſe of the ſpine of the *os frontis*, and the courſe of the ſuperior longitudinal *ſinus* under this part, which it is ſuppoſed would be n ceſſarily wounded by the ſaw, and in conſequence deſtroy the patient by the hæmorrhage: but though a perforation may, contrary to the general opinion, be made over the *ſinus* without offending it, and, even if it was wounded, the effuſion of blood would not in all probability be mortal; yet at beſt it would be very troubleſome; and ſince we are not ſtraitened in that part of the *cranium* for room, it is adviſeable to forbear operating in this place. The bony *ſinuſes* of the *os frontis* forbid the uſe of the trepan near the orbits of the eyes; therefore, if it ſhould be depreſſed near thoſe cavities, the ſurgeon muſt be careful to perforate either above, or on one ſide of the fracture; for ſawing below it will only lead into the *ſinus*, and anſwer no purpoſe in the deſign either of giving a diſcharge to the matter from the brain, or an opportunity to elevate the depreſſion; nay, perhaps leave an incurable fiſtula, if the patient eſcapes with life.

The *os occipitis* being very uneven, both in its internal and external ſurface, makes trepanning there almoſt impracticable; beſides, the great ſinuſes run about ſo much of it, as hardly to afford ſpace to perforate without danger of wounding them; but then it is ſo defended from injuries by its ſituation and ſtrength, that fractures do not happen to it ſo often as to the other bones of the *cranium*; and when they do, for the moſt part they become ſo ſoon mortal, by affecting the *cerebellum* which it ſuſtains, that the operation is ſeldom required in this caſe. Indeed the upper angle of this bone lies above the *cerebellum*, and, when fractured or depreſſed, is not attended with ſo immediate danger; but when this happens, the courſe of the longitudinal ſinus down the middle of it, and the neighbourhood of the lateral *ſinuſes* beneath it, make it adviſeable to trepan at the lower part of the *os parietale*, or at leaſt upon or juſt below the lambdoidal ſuture, ſo that the perforation of the *os occipitis* can hardly ever be proper.

Though wounds in the cerebellum are always mortal, yet great portions of the cerebrum have been carried off, or deſtroyed, without any notable inconvenience.

The places then unfit to admit the ſaw, are the three deſcribed; that is, the ſagittal ſuture; that part of the *os frontis* near the orbits of the eyes; and the *os occipitis*. But when a fracture happens in any other part above the ear, there is no objection to the operation. When there is only a ſmall fiſſure without any depreſſion or motion in the bone, the trepan may be applied on the fiſſure itſelf, which will more readily give vent to the blood or matter underneath, than if made at a diſtance. If the fiſſure be large, and the bone w akened or depreſſed, the trepan muſt be applied on one ſide of it, but ſo as to make it a part of the circumference of the ſawed piece; if the fracture run upwards, it will be eligible always to perforate near its bottom, becauſe the dependency of the oriſice will give better iſſue to the matter, though the ill-grounded apprehenſion of the brain falling out there has made many eminent ſurgeons contradict this rule in their practice. If, by making one orifice, you cannot raiſe all the depreſſed part, you muſt make a ſecond and a third, and continue doing ſo, till you have reduced the whole cranium even: there is frequently occaſion to repeat it twice or thrice; and it has been done twelve times, nay oftener, with ſucceſs; which ſhews the little dang r there is, either in ſawing the ſkull, or expoſing the *dura mater* and brain, when the preſſure is taken off. Indeed the miſchief of laying the brain bare, is ſo ſmall, compared with a concuſſion of it, or an abſceſs from pent-up matter, that thoſe fractures of the ſkull, where the bone is broken into ſplinters the whole extent of it, and can be taken away, much more readily do well, than a ſimple fiſſure only, where the abſceſs cannot diſcharge itſelf freely; for which,

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which reaſon, though the depreſſed fracture may be raiſed by the means of one orifice, yet, if it is of a conſiderable length, it will be almoſt abſolutely neceſſary to make one or two more openings, for the convenience of diſcharge; ſince, for want of this, we ſee abſceſſes increaſe daily in their quantity of matter, and at the end of a few weeks carry off the patient.

In concuſſions of the brain without a fracture of the cranium, if the trepan be applied, and vaſt diſcharges enſue, it will be alſo convenient to make more perforations into the abſceſs and the neighbourhood of the abſceſs, the ſituation of which will be eaſily gueſſed by the direction of the ſtream of matter. And here it is to be obſerved, that abſceſſes which enſue from a concuſſion are generally more extenſive and dangerous than thoſe which accompany a fracture with depreſſion: for in a fracture, the yielding of the bone deſtroys, in a great degree, the force of the ſtriking body, and prevents any violent commotion of the brain; ſo that what the brain ſuffers reſults chiefly from the preſſure of the incumbent bone, and the laceration of the veſſels, near the fracture: whereas, when the cranium reſiſts the ſhock, all, or great part of the *cerebrum* ſuſtains the concuſſion, and is often impoſtumated or inflamed almoſt in its whole dimenſion.

The manner of trepanning is this: Having fixed your patient's head ſteady, either on the bolſter of a bed, or by placing him in a low chair; with the pin of your ſaw, mark the center of the piece of bone to be taken out; then with the perforating trepan, make an orifice deep enough to receive the pin, which being fixed in it will prevent the ſaw from ſlipping; and thus you are to continue ſawing, till the impreſſion made will preſerve the ſteadineſs without the pin, when it is to be taken away, for fear of its wounding the brain before the ſaw has entered through the cranium, which it would do at laſt, becauſe of its projection. In working through the bone, the teeth of the ſaw will begin to clog, by that time you arrive to the *diploe*; wherefore a bruſh muſt be ready to clean it every now and then, and with a pointed probe you muſt clear away the duſt in the circle of the trepanned bone, obſerving, if it be deeper on one ſide than the other, to lean afterwards on that ſide where the impreſſion is leaſt, that the whole thickneſs may be ſawed through at the ſame time. To do all this with leſs interruption, it will be proper to have two ſaws of exactly the ſame diameter, that an aſſiſtant may be bruſhing one while you operate with the other. We are adviſed to ſaw boldly till we come to the *diploe*, which, it is ſaid, will always diſtinguiſh itſelf by the bloodineſs. But, however, this is not a certain mark to go by: for though, where there is a *diploe*, it will manifeſt itſelf by its bloodineſs, yet ſometimes the ſcull is ſo very thin as not to admit of any; in which caſe, if an operator ſhould puſh on his inſtrument in expectation of meeting with this ſubſtance, he would unwarily wound the brain. This is not very often the caſe; but, however, often enough to put a man on his guard, and make him inquire whether the bone be looſe after a little ſawing, which is the only rule we go by when we have paſſed through the *diploe*, and may as well be attended to before coming at it, without any conſiderable loſs of time. When it is quite ſawed through, and lies looſe, it may be taken away with the forceps contrived for that uſe; and if the lower edges of the orifice, next to the *dura mater*, are ſplintered, they may be ſcraped ſmooth with a lenticular.

Theſe are the chief proceſſes of the operation of the trepan. The only thing remaining to be done, is, with an elevator introduced at the orifice, to raiſe the depreſſion, or broken ſplinters, if they cannot otherwiſe be laid hold of, and to draw out the grumous blood, or any other extraneous body. If the *dura mater* be not wounded or torn, an inciſion muſt be made through it, to give way to the blood or matter, which almoſt certainly lie underneath it, if the ſymptoms have been bad, and none has been diſcharged from between the *cranium* and *dura mater*: Though it has been lately obſerved that an abſceſs will ſometimes be formed in the ſubſtance of the brain; and therefore, if the puncture of the *dura mater* does not procure an evacuation of the matter, and the ſymptoms of a ſuppuration are ſtill urgent, it will be adviſeable to make a ſmall inciſion with a lancet into the brain itſelf.

We have uſed the word trepan all along, for the ſake of being better underſtood; but the inſtrument here recommended is a trephine; the advantages of which, as alſo that of a cylindrical ſaw, or one nearly cylindrical, are deſcribed in the explanation of the copper-plate.

With regard to the dreſſings of theſe wounds, it is very certain, that as the greateſt part of the evil proceeds from the quantity and preſſure of the matter, whatever approaches towards the nature of a tent, and increaſes its quantity and preſſure by locking it up, muſt be pernicious: Therefore the uſe of all ſyndons whatever ſhould be excluded. The haſty application too of ſpirits of wine, which is ſo commonly adviſed, cannot be proper; as they are not only unfit for inflammations in general, but alſo criſp up the veſſels of the *dura mater* and brain, and, ſtopping the ſuppuration, ſometimes produce a gangrene. Since then a cloſe application is inconvenient, and, whatever good there may be in topical medicines, it cannot for the moſt part be communicated to the abſceſs, by reaſon of its extent beyond the orifice, the beſt remedy will be dry lint only, which muſt be laid on looſely to give vent to the matter, and be repeated twice a day till the diſcharge is leſſened, when once in twenty-four hours will be ſufficient to the finiſhing of the cure, which will be ſomething retarded by the exfoliations that ſometimes follow this operation. The patient afterwards may wear a plate of tin upon the ſcar, to defend it from blows or any accidental injury.

Explanation of Fig. 1. Plate CLVIII.

A, The perforator, commonly called the perforating trepan. With this inſtrument, an orifice is uſually made for the reception of the pin, on the centre of the piece of bone that is to be taken away, in the operation of trepanning; though if the pin be very ſharp, and project but little beyond the teeth of the ſaw, as in that marked with the letter *B*, the perforator would be needleſs; but as the point of the pin preſently grows blunt with uſe, and in that caſe it is difficult to fix the ſaw, it is adviſeable to have this inſtrument in readineſs. It is alſo handy for boring into the ſubſtance of the bones, in order to promote a granulation of fleſh on their ſurfaces. When it is made uſe of, it muſt be received and faſtened in the handle *C*.

B, The crown, or ſaw of the trepan, with the pin appearing juſt beyond the extremities of the teeth. The ſhape of this ſaw is cylindrical.

C, The handle of the foregoing inſtrument, called the trephine; which is much preferable to the trepan, (an inſtrument like a wimble uſed by joiners,) becauſe of the great

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great convenience of holding it, and leaning on one ſide or other of the ſaw, as we find it neceſſary: The trepan however, though allowed to be unhandy, is the inſtrument moſt uſed by ſurgeons in other parts of Europe, upon the ſuppoſition of its working quicker than the trephine.

The trephine here repreſented is of ſuch a ſhape as to make it a convenient elevator, for which purpoſe the extremities of it are made rough.

D, A key to take out the pin *F*, when the ſaw has made an impreſſion deep enough to be worked without the help of it.

EXPLANATION of Fig. 2. Plate CLVIII.

A, A convenient forceps to take out the circular piece of bone, when it does not ſtick to the ſaw: the contrivance by which they readily lay hold of it, is to make the extremities that are to graſp it, with an arch of the ſame circle as the ſaw is made. Upon one of the handles, there is added a little elevator, to lift up any ſmall ſplinter of bone.

B, A lenticular: the fore-part of its blade is ſharp, in order to ſcrape the lower edge of the orifice of the *cranium*, in caſe any ſplinters ſhould remain after the operation; and the button at its extremity receives the duſt, that it may not fall on the brain; but there is ſeldom any occaſion for this inſtrument.

C, A rugine or raſpatory, for ſcraping bones in order to promote granulations of fleſh. The handles of theſe two laſt inſtruments are wood, whereas every part of the others ſhould be made of ſteel.

Of the CATARACT.

THE cataract, called by the Latins *ſuffuſio*, is a diſeaſe of the cryſtalline humour, rendering the whole body of it opake, ſo that the rays of light, which, in the natural ſtate of its tranſparency, were tranſmitted to the *tunica retina*, become now totally intercepted, and produce no effect. This is pretty nearly the account delivered down to us by Hippocrates and the ancient Greeks, who likewiſe knew it by the name of *glaucoma*.

Anatomiſts have frequently diſſected the eyes of perſons under this diſorder after their death, and have found it to be always an opacity of the cryſtalline humour, agreeably to the definition of a *glaucoma*: ſo that by conſequence we muſt underſtand the words *cataract* and *glaucoma* as ſynonymous terms.

The general criterion of the fitneſs of cataracts for the operation, is taken from their colour; the pearl coloured, and thoſe of the colour of burniſhed iron, are eſteemed proper to endure the needle; the white are ſuppoſed milky, the green and yellow horny and incurable.

The depreſſion of a cataract of any colour would be the cure, if that alone was the diſtemper of the eye: but it generally happens, that the yellow cataracts adhere to the *iris* ſo firmly as to become immoveable; beſides, when they follow in conſequence of a blow, which is often the caſe, either the cells of the vitreous humour are ſo much diſturbed and broken, or the *retina* affected, that a degree of blindneſs will remain, though the cataract be depreſſed.

To judge whether the cataract adheres to the *iris*, if you cannot at once diſtinguiſh it by your ſight, ſhut the patient's eye, and rub the lids a little; then ſuddenly opening it, you will perceive the pupil contract, if the cryſtalline humour does not prevent the action by its adheſion: And when this is the caſe in any kind of cataract, the operation can hardly be adviſed.

Another conſideration of the greateſt moment, before undertaking the cure, is to be aſſured of the right ſtate of the *tunica retina*; which is very readily learnt, where there is no adheſion of the cataract, from the light falling between the *iris* and cryſtalline humour, which if the eye is not ſenſible of, it is a certain indication of another malady, and abſolutely forbids the operation. Generally this cataract takes its riſe from head-achs, convulſions, and nervous diſorders.

When none of theſe objections forbid the operation, it may be thus done: Having placed your patient in a convenient light, and in a chair ſuitable to the height of that you yourſelf ſit in, let a pillow or two be placed behind his back, in ſuch a manner, that the body bending forward, the head may approach near to you; then inclining the head a little backward upon the breaſt of your aſſiſtant, and covering the other eye ſo as to prevent its rolling, let the aſſiſtant lift up the ſuperior eye-lid, and yourſelf depreſs a little the inferior one: This done, ſtrike the needle through the *tunica conjunctiva*, ſomething leſs than one tenth of an inch from the *cornea*, even with the middle of the pupil, into the poſterior chamber, and gently endeavour to depreſs the cataract with the flat ſurface of it. If, after it is diſlodged, it riſes again, though not with much elaſticity, it muſt again and again be puſhed down. If it is membranous; after the diſcharge of the fluid, the pellicle muſt be more broke and depreſſed: if it is uniformly fluid, or exceedingly elaſtick, we muſt not continue to endanger a terrible inflammation, by a vain attempt to ſucceed. If a cataract of the right eye is to be couched, and the ſurgeon cannot uſe his left hand ſo dexterouſly as his right, he may place himſelf behind the patient, and uſe his right hand.

We have not recommended the *ſpeculum oculi*, becauſe, upon the diſcharge of the aqueous humour through the puncture, the eye, being ſomewhat emptied, more readily admits of the depreſſion of the cryſtalline humour, than when preſſed upon by the inſtrument.

As to the method of treating the ſucceeding inflammation, bleeding and other gentle evacuations are found abſolutely neceſſary.

Of Cutting the IRIS.

THERE are two caſes where this operation may be of ſome ſervice; one when the cataract is from its adheſion immoveable; and the other, when the pupil of the eye is totally cloſed up by a diſorder of the muſcular fibres of the *iris*, which gradually contracting the orifice, at laſt leaves the membrane quite imperforate. This laſt diſtemper has hitherto been deemed incurable. The adheſion of the cataract has been conſidered as a ſpecies of blindneſs not to be relieved: but Mr *Cheſelden* has invented a method of making an artificial pupil, by ſlitting the *iris*, which may relieve in both the inſtances here ſtated.

In doing this operation, the patient muſt be placed as for couching, and the eye kept open and fixed by the *ſpeculum oculi*, which is abſolutely neceſſary here; then introducing the knife in the ſame part of the *conjunctiva* you wound in couching, inſinuate it with its blade held horizontally, and the back of it towards you, between the *ligamentum ciliare* and circumference of the *iris*, into the anterior chamber of the eye; and after it is advanced to the farther ſide of it,

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make your incision quite through the membrane; and if the operation succeeds, it will upon wounding fly open, and appear a large orifice, though not so wide as it becomes afterwards.

The place to be opened in the *iris*, will be according to the nature of the disease: if the membrane itself be only affected with a contraction, the middle part of it, which is the natural situation of the pupil, must be cut; but if there be a cataract, the incision must be made above or below the cataract, though it is more eligible to do it above.

The contracted *iris*, from a paralytic disorder, is so often complicated with an affection of the *retina*, that the success is very precarious in this case. This operation has answered best in adhesions of the crystalline humour, though but very seldom even there.

Explanation of Fig. 3. Plate CLVIII.

A, The couching needle, the broad part of which towards the point is flat on one side; but on the other is a little convex, to give it more substance and strength.

The handle of this instrument is white ivory, inlaid with a streak of black in that part of it lying even with the convex surface of the blade: The meaning of which is, that by holding the handle with the streak upwards, we may be guided to depress the membrane of a milky cataract with the flat surface, though the substance of the cataract swimming in the eye obscures the needle, and prevents its being directed in a proper position by the sight.

B, A *speculum oculi*, which is made to open or shut by an iron button sliding along a slit in the handle. This instrument is composed of one piece of steel, in such a manner that it would fly open by its elasticity, if the two branches of the handle were not confined by the button. The circle of it should be covered with velvet, to make it lie softer on the eye-lids.

C, The knife for cutting the *iris*, the blade of which has two edges, resembling a lancet, which are more advantageous than one only, in cutting the *cornea* for the extraction of the cataract.

Of the Fistula Lachrymalis.

The *fistula lachrymalis* is generally understood to be such a disorder of the canals leading from the eye to the nose, as obstructs the natural progress of the tears, and makes them trickle down the cheek: but this is only the first and mildest stage of the disease. In the next, there is a mucus resembling matter, and afterwards matter itself discharged with the tears from the *puncta lachrymalia*, and sometimes from an orifice broken through the skin between the nose and angle of the eye. The last and worst degree of it is, when the matter of the abscess, by its long continuance, has not only corroded the neighbouring soft parts, but also affected the subjacent bone.

Monsieur Annell, a French surgeon, recommends in the recent fistula, to pass a small probe through one of the *puncta lachrymalia* into the *saccus* and nose, in order to break the concretions which were supposed to make the obstruction, and with a small pipe and syringe to throw an injection through the other, in order to wash them away.

The manner of operating in those cases where perforation is not required, is this: Supposing the abscess not broken, chuse a time when it is most turgid with matter; and to his end, you may shut the patient's eye the day before, and lay little slips of plaister upon one another across the lids, from about the *puncta lachrymalia* to the internal angle; which compressing their channels, and preventing the flux of the matter that way, will heap it up in the bag, and indicate more certainly the place to be cut. If the abscess is already open, the orifice and probe will inform you where to enlarge: then placing the patient in a seat of convenient height for the management of your hand; with a small incision-knife dilate from the upper part of the bag, down to the edge of the orbit, without any regard to the tendon of the orbicularis muscle, or fear of wounding the blood-vessels; though if you see the vessels, it is proper to shun them. The length of this incision, will be near four tenths of an inch. It has been advised, in opening the bag, to introduce a small probe through one of the *puncta* into its cavity, to prevent wounding the posterior part of it. But this excess of care may be more troublesome than useful; since, in so large a vessel, a very small share of dexterity is sufficient to avoid the mistake. In making this incision, care must be had, not to cut too near the joining of the eye-lids, because of the deformity of the succeeding scar; though the blear eye or uneven, contraction of the skin in that part, after the operation, is generally owing to the use of the cautery, and not to the wound of the tendon of the orbicularis muscle; for this last is necessarily from its situation always cut through, but without any inconvenience, because of the firm cicatrix afterwards that fixes it strongly to the bone.

When the bag is open, it is to be filled with dry lint, which the next day may be removed, and exchanged for a dossil dipt in a soft digestive medicine: this must be repeated every day once or twice, according to the quantity of the discharge; now and then, when the matter is not good, using the precipitate medicine, and from time to time a sponge-tent, to prevent the too sudden reunion of the upper part of the abscess. When the discharge begins to lessen, it will be proper to pass a small probe, a small bougie, or silver wire, through the nasal duct into the nose every time it is dressed, in order to dilate it a little, and make way for the tears and matter which by their drain will continue to keep it open. This method must be followed till the discharge is nearly over (which will be in a few weeks;) and then dressing superficially with dry lint, or any drying application, the wound will seldom fail of healing. After the cure, in order to prevent a relapse, it will be proper, for a few weeks, to wear the compressing instrument represented in the copperplate.

When the bone is bare, and the fistula requires perforation, the perforator is not to be carried down the *ductus ad nasum*, for fear of boring into the *sinus maxillaris*; but more internally towards the nose, which will bleed freely, if properly wounded. The wound afterwards should be dressed with dossils, in the manner above described, and the probe or silver wire be every day passed through the *ductus ad nasum*, lest, after the cure of the abscess, it should still remain obstructed; and if, upon trial, the duct should be so filled up as not to admit the wire, it will be right to keep open the perforation into the nose with a small tent, till the discharge is almost quite ceased.

Explanation of Fig. 4. Plate CLVIII.

A, The eye, with the skin of the eye-lids denuded, in order to shew the orbicularis muscle: the white streak running from the inner angle of the eye toward the nose is the tendon

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tendon of the orbicularis muſcle. At a little diſtance from the internal angle, on the edge of the eye-lids may be obſerved two black ſpots, which are the orifices of the lachrymal channels, and called the *puncta lachrymalia*.

B, The exact dimenſion of the lachrymal channels and bag; the pricked line repreſents the edge of the orbit.

C, A ſmall inciſion-knife, more handy than a larger for opening the bag.

D. The perforator to deſtroy the *os unguis*, if ever it ſhould happen to be neceſſary.

E, An iron inſtrument made thin and pliable, to ſet even on the forehead, and for uſe covered with velvet: the holes at the three extremities receive two pieces of ribband, by which it is faſtened on the forehead: the button at the end of the ſcrew is to be placed on the *ſaccus lachrymalis*, and the ſcrew to be twiſted till the button makes a conſiderable preſſure on the bag: the button ſhould be covered with velvet, and a little compreſs of plaiſter be laid on the bag before it is applied, to prevent the ſkin from being galled by the preſſure. The little branch of iron which receives the ſcrew muſt be ſoft enough to admit of bending, otherwiſe it will be difficult to place the button exactly on the bag. This inſtrument is for the left eye only; it ſhould be worn night and day in the beginning of a fiſtula, and after a fiſtula has been healed by inciſion; but as the ſucceſs depends upon the exact ſituation of the button upon the bag, it ſhould be carefully looked after.

Of Bronchotomy.

The operation of *bronchotomy* is an inciſion made in the *aſpera arteria*, to make way for the air into the lungs, when reſpiration is obſtructed by any tumour compreſſing the *larynx*, or ſome other diſorder of the *glottis* and *aſpera arteria*, without any apparent tumour.

The manner of doing it, is by making a longitudinal inciſion through the ſkin, three quarters of an inch long, oppoſite to the third and fourth ring of the trachea, if you have the choice of the place; and when you cannot make it ſo high, the rule will be to wound a little below the tumour: it is always adviſed to pinch up the ſkin for this proceſs, which however may be left to the diſcretion of the ſurgeon. When the ſkin is cut through, you muſt make a ſmall tranſverſe inciſion into the wind-pipe, and immediately introduce a ſilver crooked *canula* near half an inch long, with a couple of little rings at the top of it, through which a ribband may be paſſed round the neck, to keep it fixed in the wound.

The method of dreſſing will be eaſily underſtood; ſince, after the patient can breathe by the natural paſſage, if you withdraw the hollow tent, the wound will become a ſimple one, and, notwithſtanding its penetration through a cartilage into a large cavity, require a ſuperficial application only.

Of the Extirpation of the Tonsils.

These glands ſometimes grow ſo large and ſcirrhous as to become incurable, and even to threaten ſuffocation if not extirpated. The manner of doing this operation formerly, was by cutting them off: but the almoſt conſtant conſequence of this wound was a violent bleeding, and ſometimes too a mortal one; on which account it is rejected in favour of the ligature, which is not only void of danger, but alſo ſeldom fails of cure.

If the baſis of the tonſil is ſmaller than the upper part, you may paſs the ligature by tying it to the end of a probe, bent into the form of an arch, and ſet into a handle; which being carried beyond the gland, and round it, is to be brought back again: this done, you may eaſily tie it by the means of an inſtrument of Mr. *Cheſelden*'s contrivance, which holds one end of the ſtring on the ſide of the tonſil next the throat, while you make the knot by pulling the other with the right hand quite out of the mouth, as will be eaſily underſtood by the draught in the copper-plate. Should it happen that the tonſils are conical, ſo that the ligature will neceſſarily ſlip over its extremity when we attempt to tie; in this caſe, he has recommended an inſtrument like a crooked needle, ſet in a handle, with an eye near the point, threaded with a ligature, which is to be thruſt through the bottom of the gland, and being laid hold of with a hook, the inſtrument is to be withdrawn; then pulling the double ligature forwards, it muſt be divided, and one part be tied above, and the other below the tumour: the knots are to be always double, and the ligature to be cut off pretty near them.

If after four or five days they ſlip, or ſeem to have mortified the tonſil only in part, you muſt repeat the whole operation; and if it fail a ſecond time, you muſt even repeat it again.

This kind of extirpation is more practiſed in large piles, that are eſteemed incurable. When the piles are withinſide of the inteſtine, you muſt place your patient over a fomentation in a cloſeſtool, and have a crooked needle with a double ligature ready to paſs through them, when by ſtraining they are puſhed out of the *anus* (for ſometimes the inteſtine will return ſuddenly,) and tie above and below as in the inſtance of the tonſil. Sometimes the piles are of that ſhape as to admit a ſingle ligature to be tied round them without the help of a needle, which is leſs painful. If there are ſeveral, you muſt only tie one or two at a time; for the pain of the ligature is exceſſive, and would be intolerable if many were tied at once: however, every five or ſix days, the operation may be repeated till all are extirpated, and the parts muſt be kept ſupple by ſome emollient ointments.

When the piles are ſmall, they may ſafely and with much leſs pain be cut off.

The *uvula* is ſubject to ſo great a degree of relaxation ſometimes, that it almoſt choaks the patient; the readieſt cure is cutting off all but half an inch of it, which may be done at one ſnip with a pair of ſciſſars (particularly curved for that purpoſe,) laying hold of it with a forceps, leſt it ſhould ſlip away.

Explanation of Fig. 5. Plate CLVIII.

A, The bent probe fixed in a handle, with the ligature made of the ſame thread as the ligatures for tying the blood-veſſels.

B, The iron inſtrument for tying the tonſils.

This inſtrument is alſo of great ſervice in extirpating, by ligature, a ſpecies of ſcirrhus that ſometimes grows from the neck or cavity of the *uterus*.

C, The needle with the eye towards the point, for paſſing the ligature through the tonſil, when the baſis is larger than the extremity.

D, A *canula* made of ſilver to be uſed in the *empyema*.

E, A *canula* to be uſed in *bronchotomy*.

To keep the canulas in their place, ſmall ribbands may be

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be paſſed through the rings of them, and carried round the body and neck; or they may be held by a ligature run through, and faſtened to a hole cut in a piece of ſticking plaiſter, which is to be laid on each ſide of them.

Of the Polypus.

The polypus of the noſe, is ſaid to be an excreſcence of fleſh, ſpreading its branches amongſt the *laminæ* of the *os ethmoides*, and through the whole cavity of one or both noſtrils. It happens very often to both ſides of the noſe at once; and in that caſe is very troubleſome, almoſt ſuffocating the patient, at leaſt making reſpiration very difficult. The intent of the operation is the removal of this obſtacle.

Polypi ariſe from the membrane ſpread upon the *laminæ ſpongioſæ*, pretty nearly in the ſame manner as the *hydatids* of the *abdomen*, in one kind of dropſy, do from the ſurface of the liver; or as ganglions from the tendons, borrowing their coats from a production of its fibres and veſſels: If they appear ſoft, and of the colour of the ſerum of the blood, in all likelihood they are formed of ſuch a ſort of water contained in cyſts, which, upon breaking the membrane, leaves ſo little hold for the inſtrument, that but a ſmall part of it can be extracted afterwards. This *polypus* is to be left to harden, before the operation be undertaken, which in proceſs of time it generally will do. In the next degree of conſiſtence, they retain pretty nearly the ſame colour, and are often partly watery, and partly of a viſcid texture, which though not tenacious enough to admit of drawing them out by the roots, may at ſeveral attempts be taken away by bits. The next degree of conſiſtence, is that which is neither ſo ſoft as to be ſqueezed to pieces, nor ſo hard and brittle as to crumble, or adhere to the membrane with that force as not to admit of ſeparation: this is the moſt favourable one. The laſt, is hard and ſcirrhous, adhering ſo tight as to tear rather than ſeparate in the extraction, and ſometimes even tends to degenerate into a cancer: This *polypus* is very difficult of cure.

The *polypus* ſometimes dilates to that degree, as not only to extend beyond the *os palati*, and hang over the *œſophagus* and *trachea*; but alſo ſpreading into the *ſinus maxillaris*, ſo exactly fills up every interſtice of the noſe, as to obſtruct the lower orifice of the *ductus ad naſum*, and prevent the deſcent of the tears, which neceſſarily muſt return thro' the *puncta lachrymalia*; and ſometimes they grow ſo enormouſly large, as even to alter the ſhape of the bones of the face.

When the *polypus* appears in the throat, it is always adviſeable to contract it that way; it being found, by experience, more ready to looſen when pulled in that direction, than by the noſe. To this end, it would be right, before undertaking the operation, to let your patient lie ſupine two or three hours, which will bring it ſtill farther down; for the body of the *polypus* does not univerſally adhere, and will by its weight ſtretch out the fibres by which it is connected to the noſe; nay, there are inſtances, where by a little effort, ſuch as hawking, they have dropt quite off.

The method of extracting it is by a pair of forceps, with a ſlit at their extremities for the better hold, which muſt be introduced into the noſtril about an inch and a half, to make more ſure of it towards the roots; then twiſting them a little from one ſide to the other, you muſt continue in that action, while you pull very gradually the body of the *polypus*. If it break, you muſt repeat the extraction as long as any remains, unleſs it is attended with a violent hæmorrhage, which is an accident that ſometimes follows upon the operation, and ſeldom fails when the excreſcence is ſcirrhous: However, the ſurgeon is not to be alarmed at the appearance of an immoderate effuſion the moment after the ſeparation; for, generally ſpeaking, the veſſels collapſe very ſoon again; but if they do not, dry lint, or lint dipt in ſome ſtyptick, will readily ſtop it.

After the extirpation, it has been uſual, in order to prevent a relapſe, to dreſs with eſcharotick powders, and even to burn with the actual cautery; but neither the one or the other can be of great ſervice in this caſe, and both are painful and dangerous. If ever the uſe of corroſive medicines is adviſeable, it ſhould be for deſtroying the remainder of a *polypus* which cannot all be taken away; and then the eſcharoticks may be better conveyed to the part by a long tent, than a ſeton paſſed through the noſe and mouth, which is difficult to do without hurting the patient, and very naſty to bear.

Of the Hare Lip.

This diſeaſe is a fiſſure in the upper lip, with want of ſubſtance, and is a natural defect, the patient being always born with it, at leaſt that ſpecies of hare-lip which requires the following operation The cure is to be performed by the twiſted ſuture. There are many lips, where the loſs of ſubſtance is ſo great, that the edges of the fiſſure cannot be brought together, or at beſt where they can but juſt touch, in which caſe it need not be adviſed to forbear the attempt: it is likewiſe forbidden in infants, and with reaſon if they ſuck; but otherwiſe it may be undertaken with great ſafety, and even with more probability of ſucceſs than in others that are older.

It is not uncommon for the roof of the mouth to be fiſſured likewiſe; but this is no objection to the operation, if the ſkin of the lip is looſe enough to admit of re-union: and it may be remarked, that the fiſſure of the palate, in length of years, cloſes ſurpriſingly in ſome caſes.

The manner of doing it is this. You firſt with a knife ſeparate the lip from the upper jaw, by dividing the *frænulum* between it and the gums; and if the *dentes inciſorii* project, as is uſual in infants, they muſt be cut out with the ſame knife; then with a thin pair of ſtraight ſciſſars take off the callous edges of the fiſſure the whole length of it, obſerving the rule of making the new wound in ſtraight lines, becauſe the ſides of it can never be made to correſpond without this caution. For inſtance, if the hare lip had the ſhape *a*, Plate CLVIII. fig. 5. the inciſion of the edges muſt be continued in ſtraight lines till they meet in the manner repreſented by *b*, ibid. The two lips of the wound being brought exactly together, paſs a couple of pins, one pretty near the top, and the other as near the bottom, through the middle of both edges of it, and ſecure them in that ſituation by twiſting a piece of waxed thread croſs and round the pins ſeven or eight times; you muſt then cut off the points, and lay a ſmall bolſter of plaiſter underneath them, to prevent their ſcratching: but when the lower part only of the hare lip can be brought into contact, it will not be proper to uſe more than one pin.

The pins are made three fourths of their lengths of ſilver, and the other part towards the point of ſteel; the ſilver pin is not quite ſo offenſive to a wound as a braſs or ſteel one;

but

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but a ſteel point is neceſſary for their eaſier penetration, which indeed makes them paſs ſo readily, that there is no need of any inſtrument to aſſiſt in puſhing them through. The practice of bolſtering the cheeks forward does little or no ſervice to the wound, and is very uneaſy to the patient. The manner of dreſſing will be to remove the applications which are quite ſuperficial, as often only as is neceſſary for cleanlineſs. The method is to deſiſt the three firſt days, and afterwards to do it every day, or every other day: It is not at all requiſite to dreſs between the jaw and lip where the *frænulum* was wounded, there being no danger that an inconvenient adheſion ſhould enſue. In about eight or nine days the parts are uſually united, and in children much ſooner, when you muſt gently cut the threads, and draw out the pins, applying upon the orifices a piece of plaiſter and dry lint. It will be proper, in order to withdraw the pins more eaſily, to daub the ligatures and pins with warm water, and alſo moiſten them with ſweet oil, two or three days before you remove them, which will waſh off the coagulated blood, that would otherwiſe faſten them ſo hard to the ligature as to make the extraction painful.

Of the Wry Neck.

The operation of cutting the wry neck is very uncommon, and is never to be practiſed but when the diſorder is owing to a contraction of the *maſtoideus* muſcle only; as it can anſwer no purpoſe to ſet that muſcle free by dividing it, (which is all that is to be done,) if the others in the neck are in the ſame ſtate; and more eſpecially if it has been of long ſtanding from infancy; becauſe the growth of the *vertebræ* will have been determined in that direction, and make it impoſſible to ſet the head upright.

When the caſe is fair, the operation is this. Having laid your patient on a table, make a tranſverſe inciſion thro' the ſkin and fat, ſomething broader than the muſcle, and not above half an inch from the *clavicle*; then paſſing the probed razor with care underneath the muſcle, draw it out and cut the muſcle. The great veſſels of the neck lie underneath; but when we are aware of their ſituation, the danger of wounding them may be avoided. After the inciſion is made, the wound is to be crammed with dry lint, and always dreſſed ſo as to prevent the extremities of the muſcle from re-uniting; to which end they are to be ſeparated from each other as much as poſſible by the aſſiſtance of a ſupporting bandage for the head, during the whole time of the cure, which will generally be about a month.

Explanation of Fig. 6. Plate CLVIII.

A, The inſtrument called the probe razor to cut the *maſtoideus* muſcle in the wry neck, and is ſharp only about half its length at that end where the blade is broad.

B, The two pins with the twiſted ſuture, uſed in the hare-lip.

C, The *polypus* forceps, with one of the rings open for the reception of the thumb, which would be cramped in pulling the forceps with much force, if it were received in the ſame ſort of ring as in the other handle.

Of the Aneurism.

This is a diſeaſe of the arteries, in which, either by a preternatural weakneſs of any part of them, they become exceſſively dilated; or by a wound through their coats, the blood is extravaſated amongſt the adjacent cavities. The firſt ſpecies of *aneuriſm* is incident to every part of the body, but does not often happen, except to the curvature of the *aorta*, which is ſubject to this diſorder from the extraordinary impulſe of the blood on that part: from the curvature, it runs upwards along the carotids or ſubclavians, generally increaſing, till by its great diſtenſion it is ruptured, and the patient dies.

There are ſeveral hiſtories given of *aneuriſms* of the curvature of the *aorta;* in ſome of which, the veſſel has been ſo exceſſively dilated, as to poſſeſs a great ſpace of the upper part of the *thorax;* and the moſt curious circumſtance to be gathered from them is, that the ſpot of the veſſel which is weakeſt, and where the diſeaſe begins, generally gives way in ſuch a manner to the force of the blood continually puſhing it outwards, as to form a large pouch or cyſt, with coats nearly as thick as thoſe of the artery itſelf. However, the thickneſs of the coats of theſe cyſts will laſt but to a certain period; for when the veſſels of the coats can no longer conform to the extenſion, the circulation grows languid, the cyſt becomes thinner at its apex, and ſoon after burſts.

The ſymptoms of this *aneuriſm*, are a ſtrong pulſation againſt the *ſternum* and ribs; every *ſyſtole* of the heart; and, when it extends above the *ſternum*, a tumour with pulſation. Upon diſſection, the ribs, *ſternum*, and *claviole*, are ſometimes found carious, from the obſtruction of the veſſels of the *perioſteum*, which are preſſed by the tumour.

What we have ſpoken of hitherto, has been only the *aneuriſm* of the *thorax* from an internal diſorder; *aneuriſms* of the extremities, are for the moſt part owing to wounds, though when they happen of themſelves, they differ very little from the deſcription given of that in the *thorax*. The further ſymptoms of them are (beſides pulſation) the tumour's being without diſcolouration of the ſkin; its ſubſiding when preſſed by the hand, and immediately returning when the hand is taken away; though, if it be upon the point of burſting, the ſkin will grow inflamed, and the coagulated blood in the cyſt will ſometimes make the pulſation much leſs perceptible.

This ſpecies of *aneuriſm* may ſometimes be ſuported a great number of years, if we reſiſt its dilatation by proper bandage; but if we do not, there is danger of its burſting, and, if it be pretty large, of rotting the adjacent bones.

A ſound artery wounded through part of its external coat would in all probability produce nearly the ſame appearances as where the whole coat is weakened from an internal indiſpoſition; and this moſt likely is the caſe after bleeding in the arm, when it has not been immediately perceived that the artery was pricked, and the tumour has begun to form ſome days after the puncture; though the common appearance of an *aneuriſm* from the wound of a lancet, is a diſcharge of blood firſt through the orifice of the ſkin, and, upon being ſtopt from bleeding outwardly, an inſinuation of it among all the muſcles as far as it can ſpread, in the ſhoulder and arm: here, the arm grows livid from the *ecchymoſis*, and the blood coagulating to the conſiſtence of fleſh, prevents any ſenſible pulſation. The cyſt which ariſes near the orifice of the artery is formed by the cellular capſula enveloping the veſſels of that part, and a portion of the *aponeuroſis* of the biceps muſcle, which admitting of ſome extravaſated blood underneath it, become exceſſively thickened and expanded. Theſe membranes muſt make the cyſt, otherwiſe we could not, upon opening the tumour in the o-

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peration, diſcover ſo readily the puncture; or if the coats of the artery made it, we could not ſeparate it diſtinctly from the veſſel, which would be always dilated above and below the cyſt, as we ſee in other *aneuriſms*.

There are ſome few inſtances of ſmall *aneuriſms* and punctures of the artery from bleeding, doing well by bandage; but they almoſt all require the operation at laſt, which is to be performed nearly in the ſame manner in every part; and ſuppoſing it in the bend of the arm, is to be done after the following method.

Having applied the tourniquet near the ſhoulder, and laid the arm in a convenient ſituation, make an inciſion on the inſide of the *biceps* muſcle, above and below the elbow a conſiderable length, which, being in the courſe of the artery, will diſcover it as ſoon as you have taken away the coagulated blood, which muſt be all removed with the fingers, the wound being dilated ſufficiently for that purpoſe. If the orifice does not readily appear, let the tourniquet be looſened, and the effuſion of blood will direct you to it; then carefully carrying a crooked needle with a ligature under it, tie the veſſel juſt above the orifice; and paſſing the needle again, make a ſecond ligature below it, to prevent the return of the blood, and leave the intermediate piece of the veſſel to ſlough away without dividing it. To avoid wounding or tying the nerve in making the ligature, the artery may be cleared away from it firſt, and held up with a hook; but ſhould the nerve be tied with the artery, no great inconvenience would enſue from it. After the operation, the arm muſt be laid eaſy, on a pillow in bed, and the wound be treated in the common method, keeping it in that poſture a fortnight or three weeks, eſpecially if it ſhould ſwell much, and not digeſt kindly.

In doing this operation, it will be proper to have the amputating inſtruments ready, leſt it ſhould be impracticable to tie the artery; and even after having tied it, the arm muſt be carefully watched; and in caſe of a mortification, it may be taken off.

Of Amputation.

A ſpreading mortification has been always eſteemed ſo principal a cauſe for amputation, that it is a faſhion with writers to treat of the nature of a gangrene previous to the deſcription of this operation. However, this operation is ſpoken of as frequently unſucceſsful; and in length of time, its want of ſucceſs has been ſo unqueſtionably confirmed by repeated experiments, that ſome of the moſt eminent practitioners make that very circumſtance an exception to the operation, which ſo few years ſince was the great inducement; and the maxim is, never to extirpate till the mortification is abſolutely ſtopped, and even advanced in its ſeparation.

Gangrenes may be produced two ways; either by indiſpoſition of body, or by accident in a healthful ſtate: for as the life of a part depends upon the circulation of its fluids, whatever ſhall make the circulation ceaſe, will inevitably occaſion a gangrene. Thus a mere compreſs preventing the courſe of the blood, as effectually cauſes a mortification as any indiſpoſition in the fluids or veſſels.

It frequently happens in old age, that the arteries of the lower extremities oſſify; which deſtroying their elaſticity, muſt in conſequence produce a gangrene in the toes firſt, and afterwards in the limb nearly as high as where the oſſification terminates; ſo that in mortifications ariſing from this cauſe, we at once ſee why amputation, during their increaſe, is of ſo little ſervice, unleſs performed above the oſſification; but we have no way to judge where the oſſification ends, but by the inference we make from the gangrene's ſtopping: Hence we may learn the propriety of our modern practice in this caſe.

If by any accident the limb has been injured to that violent degree as to begin to mortify, it will be no more fit to operate here till it ſtops, than in the other inſtance; becauſe all parts that are mortified have had the diſpoſition to become ſo, before the effect is produced: and cutting off a limb, half an inch above the abſolute dead ſkin, is generally leaving a part behind, with the ſeeds of a mortification in it; ſo, unleſs we can be ſure the veſſels are not affected in the place of amputation, which will be hard to know but from the conſequence, the operation will be uſeleſs.

Sometimes the fluids of the body are ſo vitiated, as to loſe their proper nutritious qualities: and the limb becomes gangrened, not from any alteration in its veſſels, but chiefly from its ſituation, which being at a great diſtance from the heart, will be more prone to feel the ill effects of a bad blood than any other part, as the circulation is more languid in the extremities; and it ſeems not very improbable, that in ſome diſpoſitions of the blood, a mortification may alſo be a kind of critical diſcharge. When therefore a gangrene ariſing from either of theſe cauſes, is running on, amputation above it will for the moſt part be uſeleſs; ſince it is only removing one degree of the effects of the bad juices, and leaving them in the ſame ſtate to produce the like miſchief in other parts. Thus we ſee, after amputations on this account, the gangrene ſometimes fall on the bowels, or the other extremities: from which obſervation we may conclude it not ſafe to amputate, till the fluids are altered; and this alteration will preſently diſcover itſelf by the ſtopping of the mortification.

Gunſhot wounds, compound fractures, and all ſudden accidents requiring amputation, are attended with the beſt ſucceſs if immediately performed. Diſorders of the joints, ulcers of long ſtanding, and all ſcrophulous tumours, do ſometimes return on other parts after the operation. When a leg is to be amputated, the manner of doing it is this.

Lay your patient on a table two feet ſix inches high, which is much better than a low ſeat, both for ſecuring him ſteady, and giving yourſelf the advantage of operating without ſtooping, which is not only painful, but inconvenient in the other ſituation. While one of the aſſiſtants holds the leg, you muſt roll a ſlip of fine rag half an inch broad, three or four times round it, about four or five inches below the inferior extremity of the *patella*: This being pinned on, is to ſerve as a guide for the knife, which without it perhaps would not be directed ſo dexterouſly: The manner of rolling has always been perpendicular to the length of the leg; but having ſometimes obſerved, that though the amputation at firſt be even, yet afterwards the *gaſtrocnemius* muſcle contracting, draws back the inferior part of the ſtump more ſtrongly than the other muſcles can do the reſt of it; in order to preſerve the regularity of the cicatrix, allow for this exceſs of contraction, and make the circular inciſion in ſuch a manner that the part of the wound

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wound which is on the calf of the leg is a little farther from the ham than that on the ſhin is from the middle of the *patella*.

In the mean time, one of your aſſiſtants muſt carry a ſtrong ligature round the thigh, about three or four inches above the *patella*, which paſſing through a couple of ſlits in a ſquare piece of leather, he muſt twiſt with a tourniquet, till the artery is ſufficiently compreſſed, to prevent any great effuſion of blood; and to do it more effectually, he may lay a bolſter of tow or linen under the ligature, upon that part where the artery creeps. It will alſo be a little more eaſy to the patient, to carry a compreſs of linen three or four times double, round the thigh, on that part where the ligature is applied, in order to prevent it from cutting the ſkin.

The courſe of the blood being ſtooped, you muſt begin your inciſion juſt below the linen roller, on the under part of the limb, bringing your knife towards you, which at one ſweep may cut more than the ſemicircle; then beginning your ſecond wound on the upper part, it muſt be continued from the one extremity to the other of the firſt wound, making them but one line. Theſe inciſions muſt be made quite through the *membrana adipoſa*, as far as the muſcles; then taking off the linen roller, and an aſſiſtant drawing back the ſkin as far as it will go, you make your wound from the edges of it when drawn back, through the fleſh to the bone, in the ſame manner as you did through the ſkin. Before you ſaw the bones, you muſt cut the ligament between them, with the point of your knife; and the aſſiſtant who holds the leg while it is ſawing, muſt obſerve not to lift it upwards, which would clog the inſtrument; and at the ſame time, not to let it drop, leſt the weight of the limb ſhould fracture the bone, before it is quite ſawed thro'.

In amputating below the knee, it is of advantage to ſtand on the inſide of the leg; becauſe the *tibia* and *fibula* lie in a poſition to be ſawed at the ſame time, if the inſtrument be applied externally: whereas, if we lay it on the inſide of the leg, the *tibia* will be divided firſt, and the *fibula* afterwards; which not only lengthens the operation, but is alſo apt to ſplinter the *fibula* when it is almoſt ſawed thro', unleſs the aſſiſtant be very careful in ſupporting it.

When the leg is taken off, the next regard is to be had to the ſtopping the blood; which muſt be effectually done before the patient is put to bed, or there will be great danger of bleeding again, when the fever is excited, and the veſſels of the ſtump dilated, both which happen a very little while after the operation. There is no method for this purpoſe ſo ſecure, as taking up the extremities of the veſſels with a needle and ligature in the following manner. As ſoon as the amputation is performed, the aſſiſtant muſt looſen the tourniquet for a moment, upon which the orifices of the arteries will appear by the iſſue of the blood. The operator having then fixed his eye upon one of the largeſt veſſels, paſſes a crooked needle through the fleſh, a little more than a quarter of an inch above the orifice, and about the ſame depth, in ſuch a direction as to make nearly one third of a circle round the veſſel: then withdrawing the needle, he a ſecond time paſſes it into the fleſh and out again, in the ſame manner and about the ſame diſtance below the orifice of the veſſel. By this means the thread will almoſt encompaſs the veſſel, and when it is tied (which ſhould be done by the ſurgeon's knot) will neceſſarily incloſe it within the ſtructure. All the conſiderable arteries are to be taken up in the ſame manner; that is, the tourniquet is to be looſened in order to diſcover the veſſel, and then the needle is to be paſſed round. This is a much better way than uſing the artery forceps, where the veſſels are apt to ſlip away out of the ligature: and as to ſtyptick applications, their want of ſafety is ſo well known, that the uſe of them, in hæmorrhages from large veſſels, is almoſt univerſally rejected; though it is thought by ſeveral ſurgeons who have experienced the virtue of agaric, that it will be found to be a more powerful aſtringent than any hitherto diſcovered.

It ſometimes happens in a large ſtump, that ten or more veſſels require tying; which done, you muſt apply looſe dry lint to the wound; or in caſe the ſmall veſſels bleed plentifully, you may throw a handful of flour amongſt the lint, which will contribute to the more effectual ſtopping up their orifices. Before you lay on the pledgit, you muſt bind the ſtump, and begin to roll from the lower part of the thigh down to the extremity of the ſtump. The uſe of this roller is to keep the ſkin forwards, which notwithſtanding the ſteps already taken to prevent its falling back, would in ſome meaſure do ſo, unleſs ſuſtained in this manner. The dreſſing may be ſecured by the croſs cloth and gentle bandage; and the method of treating the wound may be learnt from what has been ſaid with reſpect to recent inciſed wounds.

In amputating the thigh, the firſt inciſion is to be made a little more than two inches above the middle of the *patella*. After the operation, a roller ſhould be carried round the body, and down the thigh, to ſupport the ſkin and fleſh: this is alſo the moſt proper bandage, as abſceſſes will ſometimes form in the upper part of the thigh, which cannot diſcharge themſelves ſo conveniently with any other, it being almoſt impracticable to roll above the abſceſs, unleſs we begin from the body.

The amputation of the arm or cubit differs ſo little from the foregoing operations, that it will be but a repetition to deſcribe it. However, it muſt be laid down as a rule, to preſerve as much of the limb as poſſible, and, in all amputations of the upper limbs, to place your patient in a chair.

The amputation of the fingers and toes is better performed in their articulation, than by any of the other methods: for this purpoſe, a ſtraight knife muſt be uſed, and the inciſion of the ſkin be made not exactly upon the joint, but a little towards the extremity of the fingers, that more of it may be preſerved for the eaſier healing afterwards: it will alſo facilitate the ſeparation in the joint, when you cut the finger from the *metacarpal* bone, to make two ſmall longitudinal inciſions on each ſide of it firſt. In theſe amputations, there is generally a veſſel or two that require tying, and which often prove troubleſome when the ligature is omitted.

It may happen that the bones of the toes, and part only of the *metatarſal* bones, are carious; in which caſe, the leg need not be cut off, but only ſo much of the foot as is diſordered: a ſmall ſpring-ſaw is better to divide with here, than a large one. When this operation is performed, the heel and remainder of the foot will be of great ſervice, and the wound heal up ſafely.

EXPLANATION of Fig. 7. Plate CLVIII.

A. The figure of the amputating knife. The length of the blade and handle ſhould be about thirteen inches.

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B, The figure of the ſaw uſed in amputating the limbs. The length of the handle and ſaw ſhould be about ſeventeen inches.

Of LUXATIONS.

A BONE is ſaid to be luxated or diſlocated, when it is moved out of its place or articulation, ſo as to impede its proper motion and office.

LUXATION *of the* NOSE.

IT ſometimes happens, that the bones of the noſe are ſeparated from each other, or diſtorted out of their natural places, by ſome violent blow or fall. When ſuch an accident happens, it is ſeveral ways diſcovered: as, (1.) By the ſight, when we behold the deformed poſition of the noſe; or, (2.) By feeling; or laſtly, (3.) By the ear, when perceive with what difficulty the patient draws his breath through his noſtrils.

When this caſe happens, the patient is to be ſpeedily placed in a high chair, that an aſſiſtant may ſtand behind and hold his head firm, in a proper poſture: the ſurgeon is then to introduce with one hand, a thick probe, a gooſe-quill, or little ſtick ſhaped for the purpoſe, up the noſtril internally, by which means the depreſſed parts of the noſe may be thruſt into their places: in the mean time he applies his other hand externally, to guide and direct the parts which are moved from within: this being done, there is ſcarce any thing elſe required but to let a bit of ſticking plaiſter lie upon the noſe at the ſame time.

Of a DISLOCATION *of the* LOWER JAW.

THE lower jaw is indeed ſeldom luxated, becauſe it is held ſo firm by ſtrong ligaments and muſcles, by whoſe aſſiſtance it is retained in two ſinuſes in the baſis of the *cranium*: but when it is by accident forced out from thence, it may chance to be on one ſide only, or elſe on both, it being then thruſt directly forwards: and this happens moſt frequently from opening the mouth too wide in yawning; though it has ſometimes been occaſioned by a violent blow or fall. If it be luxated on both ſides, the chin will incline downward, and the jaw will be thruſt very forward: but if only on one ſide, the chin will be inclined toward the oppoſite ſide; the elapſed little head of the jaw not being capable of diſlocation but foreward and inward; for the proceſſes of the bones of the *cranium* prevent the jaw from being diſlocated backwards.

The lower jaw is chiefly known to be luxated on one ſide, when the chin is diſtorted on the oppoſite ſide: for that part to which the chin inclines, is the ſound; but that from whence it recedes, is the luxated one: the mouth in this caſe gapes wider than uſual, ſo that the patient cannot ſhut it, nor eat with his teath; the lower range of teeth being projected beyond, and on one ſide the upper: but when the jaw is luxated on both ſides, then the mouth not only gapes wide and open, but the chin alſo hangs down, and is thrown directly forwards; ſo that the patient cannot ſhut his mouth, ſpeak diſtinctly, or even ſwallow any thing without much difficulty.

When the jaw is out only on one ſide, and the caſe recent, the cure is uſually not ſo very difficult; but when both heads are diſlocated, and not preſently reſtored to their places, it always occaſions the worſt of ſymptoms, as pains, inflammations, convulſions, fevers, vomitings, and at length death itſelf.

When this kind of luxation happens, the patient is to be directly ſeated on a low ſtool, ſo that an aſſiſtant may hold his head firm back againſt his breaſt. Then the ſurgeon is to thruſt his two thumbs as far back into the patient's mouth as he well can; but they are firſt wrapped round in a handkerchief, to prevent them from ſlipping or being hurt; and his other fingers are to be applied to the jaw externally: when he has got firm hold of the jaw, it is to be ſtrongly preſſed, firſt downwards, then backwards, and laſtly upwards, but ſo as that they may be all done in one inſtant; by which means the elapſed heads of the jaw may be very eaſily ſhoved into their former cavities.

If the jaw be out on one ſide only, every thing muſt be done in the ſame manner: but the luxated ſide of the jaw muſt be forced more ſtrongly downward and backward than the ſound one.

Of LUXATIONS *of the* HEAD *and* SPINE.

THE luxations which happen in the *ſpine* and *vertebræ* of the back are generally imperfect ones. For it appears from an accurate conſideration of the ſtructure and articulation of theſe bones, that none of the *vertebræ* can be entirely diſplaced without being fractured, and alſo compreſſing or wounding the ſpinal marrow, which muſt produce danger of inſtant death. Even the imperfect luxations of theſe bones are very dangerous: which happen either between the two ſuperior *vertebræ* of the neck and the head, or elſe between the reſt of the *vertebræ*, when they are forced from each other.

Such as have a luxation between the head and upper *vertebra*, ſeldom eſcape being carried off by a ſpeedy and ſudden death: for in this caſe the tender *medulla* which joins immediately with the brain, and is lodged in the ſpine, the brain itſelf, and the nerves which ariſe beneath the *occiput*, are too much diſtended, compreſſed, or lacerated; the two condyloide proceſſes of the *occiput* uſually ſlip out of their glenoide ſinus's in the firſt *vertebræ* of the neck, when a perſon falls headlong from a high place, from off a ladder, from on horſeback, or when he receives a violent blow upon his neck: they dying very ſuddenly in this caſe, are vulgarly ſaid to have *broke their neck*, though there is generally no more than a luxation: yet it ſometimes happens that the *vertebræ* of the neck are really fractured. If life ſhould remain after ſuch a luxation, which very rarely happens, the patient's head is commonly diſtorted with his chin cloſe down to his breaſt, ſo that he can neither ſwallow any thing, nor ſpeak, nor even move any part that is below his neck: therefore, if ſpeedy aſſiſtance be not had, death enſues, from the compreſſure or hurt of the *medulla*.

But to repulſe this unwelcome meſſenger, the patient is to be immediately laid flat upon the ground or floor: then the ſurgeon kneeling down with his knees againſt the patient's ſhoulders, is to bring them together ſo as to contain the patient's neck between them: this done, he quickly lays hold of the patient's head with both his hands, and ſtrongly pulling or extending it, he gently moves it from one ſide to the other; till he finds, by a noiſe, the natural poſture of the neck, and the remiſſion of the ſymptoms, that the diſlocation is properly reduced: by this method the ſurgeon retains the patient firm between his knees, and per-

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performs the extenſion and reduction between his hands.

It will be proper, in order to prevent a tumor, and reſtore the ſtretched ligaments of the neck to their former vigour, to bathe it with *aq. Hungar. ſp. vin. camph.* or ſome other ſtrengthening ſpirit applied warm, as alſo compreſſes dipped in the ſame: the patient ſhould bleed, and reſt gently for ſome days, till the neck be found ſufficiently ſtrong and well.

With reſpect to the reſt of the *vertebræ* of the back, they are ſeldom moved quite out of their places, unleſs they are fractured, they being retained, for the greateſt part, by adhering to the adjacent ligaments and muſcles: therefore the luxations which happen among them are uſually imperfect; no more being diſplaced than their two upper or lower proceſſes, and they often but on one ſide; and this happens ſometimes to one of the ſpinal *vertebræ*, and ſometimes to more. But it is here to be briefly obſerved, that it is uſual to include among the number of luxated *vertebræ*, that which is ſound and firm, but intercepted by others which are not ſo: thus whenever the upper *vertebræ* of the loins from the laſt of the back, and lowermoſt *vertebræ* of the loins next the *os ſacrum*, are luxated, we commonly ſay and reckon there are five *vertebræ* out of their places; when, ſtrictly ſpeaking, only the two outermoſt or the uppermoſt and lowermoſt of thoſe *vertebræ* are diſturbed, the three middle ones retaining their natural ſituation and connection.

The ſigns common to luxations in the *ſpina dorſi* are chiefly the following: the back itſelf is found to be crooked or unequal, after the external violence has been inflicted; the patient can neither ſtand nor walk, and his whole body ſeems to be paralytic; the parts which are beneath the luxated *vertebræ* are nearly without all ſenſe and motion; the excrements and urine cannot be diſcharged, or elſe they are ſometimes emitted involuntarily; the lower extremities grow dead by degrees; and, at length, death itſelf follows: but theſe ſymptoms vary in proportion to the degree of violence in the luxation.

Luxations of the ſpinal *vertebræ* are very difficult to reduce. The following ſeems to be the moſt ſuitable method of reducing luxations of the *vertebræ*: when the *apophyſes* of the *vertebræ* are diſlocated on both ſides, the patient is to be laid leaning upon his belly over a caſk, drum, or ſome other gibbous body; then two aſſiſtants are ſtrongly to preſs down both the ends of the luxated ſpine, on each ſide; by which means the bones of the ſpine will be ſet free from each other, lifted or puſhed up in the form of an arch and ſo gradually extended. This done, the ſurgeon preſſes down the luxated *vertebræ*, and at the ſame time nimbly puſhes the ſuperior part of the body upwards: and by this means the luxated *vertebræ* are ſometimes commodiouſly reduced into their right places; but, if ſucceſs ſhould not attend the firſt time, the method ſhould be repeated two or three times more.

It ſeems proper, after the *vertebræ* are reduced, to bathe the ſpine with *ſp. vin.* or to lay on compreſſes dipped in *ſp. vin. camph* Afterwards the patient is to be laid in a ſoft and even bed; bleeding, and bathing the weak parts with ſtrengthening ſpirits, are to be uſed as there may be occaſion.

Of Luxations *of the* Os Coccyx, and Ribs.

The *os coccyx* may be thruſt inwards by a violent fall or blow, and it is often puſhed outwards in hard birth. When this happens, it is uſually attended with violent pain and inflammation about the lower part of the ſpine, abſceſſes form in the *inteſtinum rectum*, and the *fæces* are conſtipated or ſuppreſſed. To diſcover the luxation of this bone the more readily, we have recourſe to the uſe of our hands and eyes, as well as to the knowledge of the forementioned ſymptoms: nor is the replacing this bone very difficult, if attempted by a careful and expert ſurgeon; for if it be thruſt outwards, it muſt be depreſſed into its right place by the thumb, after which may be applied compreſſes dipped in warm wine, or its ſpirit, made broad above, and narrow below, to fill up the poſterior *ſinus* of the *nates*; and theſe may be held on by the T bandage; but that part of this bandage which comes between the thighs ſhould be ſlit, and placed ſo that the patient may go to ſtool without undoing the bandage, and to prevent the bone from being by that means diſplaced again.

When the *os coccyx* happens to be luxated inwards, the firſt finger is to be introduced into the *anus*. After it has had its nail cut and been dipped in oil, it muſt be thruſt as far as poſſible, that it may the more readily drive out the depreſſed bone; the other fingers being applied externally, are to conduct the bone into its right poſture: when this has been done, it will be proper for the patient to reſt ſome time upon the bed; and when he ſits up, it ſhould be in a chair with a hole in its bottom, leſt the affected part ſhould be otherwiſe compreſſed or diſturbed.

The ribs are indeed ſometimes, though but ſeldom, diſlocated; for upon the aſſault of ſome external violence, it is not uncommon for them to be diſplaced either upwards, downwards, inwards, or outwards. They cannot be eaſily luxated outwards, becauſe prevented by the vertebral proceſſes, and reſiſted by very thick and ſtrong muſcles: but when they are drove into the cavity of the *thorax*, they not only lacerate the *pleura*, but do generally great injury to the contained parts; in conſequence whereof ariſe moſt ſharp pains, inflammations, difficulty of breathing, cough, ulcers, immobility, and many other dangerous ſymptoms of the like nature.

When the rib is diſlocated either upwards or downwards, in order to replace it conveniently, the patient is to be laid on his belly upon a table, and the ſurgeon muſt ſtrive to reduce the luxated rib into its right place with his hands; or, the arm of the diſordered ſide may be ſuſpended over a gate or ladder, and while the ribs are thus ſtretched up from each other, the heads of ſuch as are luxated may be puſhed into their former ſeat.

But thoſe luxations wherein the heads of the ribs are forced into the *thorax*, are generally found to be much the moſt difficult to reduce; ſince neither the hand, nor any other inſtrument, can be applied internally to direct the luxated heads of the ribs: in this caſe it ſeems proper to lay the patient on his belly over ſome gibbous or cylindric body, and to move the fore-part of the rib inwards towards the back, ſhaking it ſometimes; for thus generally the head of the luxated ribs ſlips into its former place: but if this method of cure will avail nothing, and the deplorable condition of the patient requires ſpeedy help, we have no remedy left but inciſion, and endeavouring to replace the luxated head of the rib with the fingers, plyers, or little hooks. In the mean time, where the ſymptoms are not very urgent, and the heads of the ribs but little diſplaced, it is adviſeable neither to cut the fleſh, nor violently force the ribs; be-

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cauſe there are ſeveral inſtances where the luxated ribs have retained their diſlocated ſtations without any hurt: but above all, care muſt be taken to lay on a compreſs dipped in warm *Sp. Vin.* or *Sp. Vin. Camph.*

The clavicles may be diſlocated either from the top of the *ſternum*, or *proceſſus acromion* of the *ſcapula*, by ſome external violence, as a fall, blow, the lifting ſome great weight, or the like.

Of a LUXATION *of the* HUMERUS.

THE *humerus*, from the length and laxity of its ligaments, the largeneſs of its motion, and the ſhallowneſs of the cavity in the *ſcapula*, into which it is articulated, is thereby rendered of all bones the moſt ſubject to be luxated. The head of this bone may often be diſlocated under the arm-pit, ſometimes forwards, ſometimes backwards, and even below the *ſpacula*; but ſeldom perpendicularly downwards, and never directly upwards unleſs the *acromion* and *coracoids* proceſſes of the *ſcapula* ſhould chance to be fractured at the ſame time: beſides, as long as the ſtrong *deltoide* and *bicipital* muſcles of the *humerus* remain entire, they greatly reſiſt and keep down the *humerus* from being luxated upwards.

When the *humerus is luxated downwards*, (1.) There ſuddenly appears a cavity, and upon preſſing with the fingers you will perceive a *ſinus*; but under the arm there muſt be a tumour, becauſe the head of the bone is thruſt there. (2.) The *proceſſus acromion* will ſeem to ſtick out further than uſual, becauſe of the adjacent *ſinus*. (3.) The The luxated arm will be longer than the other, and it cannot be lifted up towards the head without violent pain, and ſometimes it cannot be lifted up at all, or even extended. But when the *humerus is luxated forwards* as well as downwards, there will be obſerved the ſame *ſinus* under the *proceſſus acromion* as before, and a tumour will appear from the head of the *humerus* projecting towards the breaſt, under the *axilla*: the arm itſelf alſo cannot be moved without exciting the moſt acute pain. Laſtly, When *the humerus is luxated backwards*, the *cubitus* is thrown forwards towards the *præcordia*, and the head of the bone makes a protuberance in the ſhoulder; the arm itſelf cannot be bent nor extended, nor even pulled outwards from the breaſt, without occaſioning the moſt violent pains: but no luxation of this limb is attended with ſuch dangerous ſymptoms, as when it is diſlocated forwards or inwards; becauſe the luxated head of the *humerus* cannot avoid injuring the large arteries and nerves of the arm; in conſequence of which, various ſymptoms will ariſe.

As ſoon therefore as the luxation is diſcovered in the *humerus*, the ſafeſt way will be to ſeat the patient on the floor, or on a low ſtool. Two ſtrong aſſiſtants are to be placed on each ſide the patient: one of which ſhould ſecure his body, and, if poſſible, the *ſcapula* too, that it may not give way to the extenſion; while the other lays firm hold of the luxated arm with both his hands, a little above the *cubitus*, gradually and ſtrongly extending it. But before that extenſion be made, the ſurgeon himſelf ſhould have a large napkin, of a ſufficient length, tied at the ends, and hung about his neck ſo that the knot may be behind; but the other part of the napkin muſt hang over his breaſt: then the patient's arm muſt be put through the napkin up to the ſhoulder, and the ſurgeon at the ſame time lays hold of the head of the *humerus* with both his hands: this done, he orders the aſſiſtant to extend the limb ſufficiently, and in the mean time he himſelf elevates the head of the patient's *humerus* by the napkin about his neck, directing it with his hands, till it ſlip into its former cavity in the *ſcapula*.

Of a LUXATION *of the* CUBITUS.

THE *cubitus*, conſiſting of two bones, the *ulna* and the *radius*, is articulated by *ginglymus*. The connection of theſe bones is ſuch, that the *ulna* or *cubitus*, as being the largeſt bone, and ſeated in the inferior part of the arm, does of itſelf perform the whole flection and extenſion of the arm; yet it cannot perform that motion without carrying the *radius* along with it; ſo that the *radius* always follows the *ulna* in flection and extenſion: but, on the other hand, the *radius* may be turned along with the hand both inward and outward, without at all moving or bending the *ulna*; as when the pronation and ſupination of the hand is made thereby. Both theſe bones of the *cubitus* are ſo articulated with the lower head of the *os humeri*, that large protuberances are received into deep cavities or grooves, and the whole inveſted and faſtened with exceeding ſtrong ligaments; ſo that notwithſtanding the *cubitus* may be luxated in all four directions, outward, inward, forward, and backward, yet it is but ſeldom that it ſuffers a perfect or entire diſlocation, unleſs the upper part of the *ulna*, called *olecranon*, be broken, or the ligaments of the *cubitus* much weakened, by ſome very great external violence.

If the *cubitus be luxated backward*, which is the moſt frequent of all others, then the arm becomes crooked and ſhorter, and it cannot be extended. In the inward part of the bend of the arm, the head of the *humerus* may be obſerved to ſtick out; in the back part of the ſame, the head of the *ulna* or *olecranon* will be protuberant, and between both bones will appear a *ſinus* or cavity. But it very ſeldom happens that the *cubitus is luxated forward*, from the largeneſs of the *olecranon*: unleſs that be fractured at the ſame time. But if this ſhould happen, the head of the *humerus* will ſtick out behind, and that of the *cubitus* before; and there will be a cavity more or leſs in proportion to the degree of the luxation. When the *cubitus is luxated externally*, the protuberance appears on the outſide of the *cubitus*; and the contrary when luxated inwards. To conclude, unleſs the ligaments and muſcles of the *cubitus* are quite broken in two, it is ſo far from being capable of ſuffering a perfect diſlocation, that no more can happen to it than a ſubluxation, *i. e.* it can but recede but a very little way out of its right place: but whatever of this kind happens, the caſe may be very eaſily underſtood, by feeling and inſpecting the part, if there be no tumor; but if the joint be much ſwelled, it is very difficult to be diſcovered.

Be the luxation, however, more or leſs, the patient muſt be ſpeedily placed in a chair; and both parts of the limb, the *humerus* and the *cubitus*, muſt be extended in oppoſite directions by two ſtout aſſiſtants, till the muſcles are found pretty tight, with a free ſpace between the bones: then the luxated bone muſt be replaced with the ſurgeon's bare hands, or together with bandages; and that the proceſſes may fall into their *ſinuſes*, the *cubitus* muſt be afterwards ſuddenly bent. But if the tendons and ligaments are ſo violently ſtrained, that they can ſcarce perform their office; it will not be improper to anoint them well with emollient oils, ointments, or the fat of animals, or to apply emollient fomentations and cataplaſms.

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As ſoon as the reduction has been by theſe means effected, the articulation muſt be bound up with a proper bandage, and the arm is to be afterwards ſuſpended in a napkin or ſling about the neck: but care muſt be taken, that the bandage be not ſuffered to be on too long, nor the arm to be kept all the time ſtill, without ſome gentle motion.

On Luxations *of the* Hand, Carpus, Metacarpus, *and* Fingers.

Notwithstanding the hand is very accurately connected to the two preceding bones, and particularly to the *radius*, by means of the *carpus* and ſtrong ligaments, yet it ſometimes ſuffers luxation in all four directions; but it is generally not ſo eaſy to be luxated on either ſide, as forward or backward, becauſe of the two proceſſes of the *radius* and *ulna*, which guard it on each ſide. The hand is ſaid to be *luxated forwards* or *inwards*, when it recedes from the muſcles which bend the fingers; to be *luxated backward*, when it departs from the muſcles which extend the fingers: much alſo in the ſame manner, the hand is judged to be *luxated outward*, when the *carpus* makes a tumor near the thumb, and a cavity near the little finger; to be *luxated inward*, when the contrary happens.

It ſeems to be the ſafeſt way immediately to reduce what is diſplaced; and that this may ſucceed the better, two things are to be chiefly regarded: (1.) That the luxated hand be ſufficiently extended by two aſſiſtants, one of which is to lay hold of the hand, and the other of the *humerus*, pulling in oppoſite directions: (2.) That the part of the extended hand, where the *ſinus* is, be placed on a table, or ſome other flat body, that whatever ſhocks up may be depreſſed: by which method the hand, in whatever part luxated, may be very readily reduced into its natural ſeat.

It alſo ſometimes happens, that one or two of the eight little bones of the *carpus* are luxated and diſtorted from their natural ſeat by ſome external violence. When this happens, there will be perceived a tumor in one part, and a cavity in another, which may be alſo felt by the fingers; beſides, violent pains will be felt by the patient. For the reſt, as this kind of luxation is very eaſily diſcovered, partly by the ſight, and partly alſo by feeling; ſo, when it is recent, it is almoſt as readily cured, letting the hand be extended in the manner we before propoſed, and the diſlocated bone be afterwards forced into its place.

The four ſmall bones, which are found in the *metacarpus* or palm of the hand, may be ſometimes luxated from the *carpus* itſelf, to which their upper parts are connected; which uſually happens from ſome external violence. The two bones which are ſeated in the middle between the two other external ones, cannot be diſlocated to either ſide; as the two external ones which ſuſtain the firſt and little fingers cannot be luxated inwardly, but are more eaſily driven outward: though each of them may be luxated on the fore or back part of the hand. But which ever of theſe happens, the particular diſorder may be diſcovered and examined by feeling and inſpecting, and the cure may be carried on in altogether the ſame method which we directed before.

Laſtly, The bones of the fingers, to which we join thoſe of the thumbs, are liable to luxation at each of their articulations, and that in ſeveral directions. But theſe accidents, if recent, are both very eaſy to diſcover and cure: for the ligaments being not very robuſt, the fat and muſcles thin, and the *ſinuſes* of the articulations ſhallow, render the extenſion very eaſy, and the reduction of them into their former places may be done very readily. While one hand of the ſurgeon extends the finger, he ſtrives with his other to replace the bones in their natural ſeat.

Of a Luxation *of the* Thigh.

Very rare is it that the head of the thigh-bone is diſplaced out of its *acetabulum*; though formerly it was ſuppoſed to be pretty frequent, phyſicians taking a fracture thereof for a luxation, the reaſon whereof may be taken from the articulation itſelf: (1.) How very deep is the *ſinus*, called by the ancients *ſinus coxæ*, and by the moderns *acetabulum*, into which the head of the thigh-bone is received. (2.) With what a broad concave cartilage is almoſt the whole head of that bone covered. (3.) How ſtrong are the ligaments with which it is faſtened. (4.) How greatly it is defended with exceeding ſtout and thick muſcles. (5.) But how very brittle is the neck of this bone beyond any other part thereof: from all which it appears, that the neck muſt be far more frequently and eaſily broke, eſpecially in adults, than its head diſlocated: and though ſomething of this kind may ſometimes happen, ſo as to make the head of the thigh-bone ſlip out of its *acetabulum*; yet that generally proceeds more from internal than external cauſes: for we find it has been obſerved by very ſkilful phyſicians, that the ligaments of the thigh-bone, though very ſtrong, may be by various cauſes, and particularly by a flux of humours, ſo relaxed and weakened, as to let the head of that bone ſlip ſpontaneouſly out of its *acetabulum*; ſo that it ſhould ſeem no great wonder if the thigh ſhould be ſometimes luxated even while the patient lies in bed, without any external violence, ſo that when they riſe, one leg appears longer or ſhorter than the other, and ſeems as if it were unhinged.

But this caſe does not happen ſo eaſy in robuſt adults, as in ſuch as are more young and tender.

Whenever the ſaid head of the thigh-bone is thruſt out, it is almoſt always wholly diſplaced, ſo as to make a perfect luxation. The exact roundneſs of this head, with the great force of the circumjacent muſcles, and the narrowneſs of the ſides of the *acetabulum*, will not admit the bone to be diſlocated a little way only; for as ſoon as the head of this bone is thruſt up to the edge of the *acetabulum*, it muſt unavoidably either turn quite out, or elſe fall back again into its right place.

The thigh is uſually luxated four ways; *upward*, *downward*, *backward*, and *forward*; but it is moſt frequently diſlocated downwards and inwards, towards the large *foramen* in the *os pubis*: for beſides that the cartilaginous defence on the lower part of the *acetabulum* is not ſo high as the reſt, the *ligamentum rotundum* is found to give way more eaſily in that part than any other: and laſtly, the adjacent muſcles are found to be weakeſt in their reſiſtance on this part, being inſufficient to keep the head of this bone from ſlipping out; and then there is a certain eminence in this edge of the *acetabulum*, which keeps the head of the *os femoris* from falling back again into its right place: but if the head of this bone be diſplaced outwards, it generally ſlips upwards at the ſame time; it being ſcarce poſſible but the very ſtrong muſcles of the thigh muſt then draw the bone upwards, and then there is no eminence there, in the edge of the *acetabulum*, to reſiſt the head of the bone in that paſſage; but ſhould it at any time be luxated by an external

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ternal force, there muſt certainly be a rupture of the round ligament.

When the thigh is diſlocated forwards and downwards, which is what uſually happens, the leg hangs ſtraddling outward, and is longer than the other; alſo the knee and foot turn outwards; the head of the bone itſelf will be felt near the lower part of the *inguen* and *os pubis*: ſometimes there is a ſuppreſſion of urine in this caſe; when ſome nerve, which communicates with the bladder, is violently compreſſed; in the buttock may be perceived a cavity, from the *trochanter major* and the reſt of the bone being diſplaced; and if the thigh-bone be not timely replaced into its *acetabulum*, the whole limb withers ſhortly afterwards; and this is the reaſon why the patient can bear little or no ſtreſs upon that limb, but muſt always incline and throw the weight of his body upon the other.

But if the thigh-bone be diſplaced backward, it is uſually drawn upward alſo at the ſame time: hence there will be perceived a cavity behind the *inguen*; but upon the haunch or buttock, a tumour; becauſe the head and *trochanter* of this bone will be thruſt there. The tumour in the haunch being thruſt upwards, the reſt of the limb will become ſhorter than the other, and the foot will ſeem to turn inwards; the heel will not touch the ground, and ſo the perſon will ſeem to ſtand upon his toes; and laſtly, the luxated limb may be bent with more eaſe than extended.

We do not without reaſon judge the thigh to be luxated, (1.) When we find the ligaments of the bone have been relaxed by ſome preceding congeſtion of humours, and when no external violence has been exerted upon it, eſpecially in young patients. (2.) When neither the ſymptoms, pain, tumour, or inflammation follow: and laſtly, (3.) When the whole limb may be bent and turned about at the *acetabulum* without any cruſhing of the bones, which is otherwiſe common in fractures. The contrary of theſe ſigns are ſtrong indications that a fracture is preſent; more particularly if the foot in grown perſons be ſhorter, from the injury of any external violence, and you hear a grating of the bones in moving the limb.

The luxated bone is always to be replaced in a method agreeable to the nature and direction of the diſlocation. When it is diſplaced forwards and downwards, the patient is to be laid flat upon his back on a table; then a linen napkin or ſtrong ſling is to be made faſt over the groin about the part affected, ſo that one end of the ſling may come over the belly, and the other over the *nates* and back, to be both tied together in a knot upon the ſpine of the *os ilium*, and afterwards faſtened to a hook fixed in ſome poſt, or held firm by ſome aſſiſtants; rather the firſt, if we uſe the polyſpaſton or pulley, to retain the patient's body firm from giving way in the extenſion; in like manner, at the bottom of the thigh, a little above the knee, there muſt be alſo faſtened another napkin, or ſling, with a compreſs between it and the thigh. Both the ſlings being drawn tight, the thigh is to be extended, not vehemently, but only ſo much as is ſufficient to draw the bone out of its ſinus, that it may be replaced into its *acetabulum* by the ſurgeon's hands; one hand is to preſs the head of the thigh-bone outward, while the other conducts the knee inwards; or, the reduction may be made by napkins, faſtened round the extremities of the thigh like ſlings, much as in a luxation of the humerus; which will be more likely to ſucceed if the knee be at the ſame time preſſed inwards by the hands. When the fore-recited means are not ſufficient to make the extenſion, it will be neceſſary to make uſe of the polyſpaſton or pulley. As ſoon as the thigh is found to be ſufficiently extended, the ſurgeon muſt take particular care to reſtore the luxated head of the thigh-bone with his hands from the *os pubis* into its former ſeat.

Whenever the thigh is luxated backward, the patient is to be placed flat on a table, with his face downward; and the thigh is to be extended in directly the ſame manner, but a little more ſtrongly than we juſt now propoſed; and the reduction is to be effected afterwards by the ſurgeon's hands, an aſſiſtant in the mean time extending the limb, and turning it inwards; by this means the head of the thigh-bone generally ſlips very readily again into its *acetabulum*.

Of a LUXATION *of the* PATELLA *and* KNEE, *or* TIBIA *and* FIBULA.

THE *patella* is uſually luxated moſtly on the internal or external ſide of the joint; but whenever the knee is perfectly luxated, the *patella* can ſcarce avoid being diſplaced at the ſame time, becauſe of its ſtrong connection to the thigh and *tibia*.

The reduction of a luxated *patella* is uſually no very great difficulty, if the patient be laid flat on his back upon a table or bed, or if he be laid in that poſture upon an even floor, ſo as that the leg may be pulled out ſtrait by an aſſiſtant: for then the ſurgeon may firmly graſp the patella with his fingers, and afterwards preſs it ſtrongly into its right place; which may be alſo effected if the patient ſtands upright: when this is done, there remains nothing but carefully to bind up the diſordered part, and to let the patient reſt quietly for ſome days, ſometimes gently bending and extending his leg to prevent it from growing ſtiff, till the pains are gone off, and the limb has recovered its former ſtrength.

A luxation of the knee is properly ſo, when the *tibia* recedes from under the *femur*. The leg is ſometimes luxated from the baſis of the thigh-bone, either on the out or inſide, or backwards; ſeldom or never forwards, unleſs it be forced and driven very violently that way; becauſe forwards, the patella is bound againſt the articulation, by the very ſtrong tendons of the muſcles which extend the leg; nor is it eaſy for the bones of the leg to be wholly diſplaced from that of the thigh, ſo as to make a perfect luxation; by reaſon of the great ſtrength of the ligaments, and the two deep *ſinuſes* which receive the head of the thigh-bone.

As this kind of luxation is very eaſy to diſcover from the thin covering of the joint, with the tumors and cavities which follow; ſo, when it is diſcovered, it is as difficult to make a perfect cure thereof, without letting the bones join together; or leaving ſome ſtiffneſs in the knee; which firſt accident is uſually called an *anchyloſis*.

When the knee is but ſlightly luxated, the patient is to be ſeated on a bed, bench, or table, and one aſſiſtant holds the thigh firm above the knee, and the other extends the leg; but the ſurgeon in the mean time replaces the bones by his hands and ſlings if neceſſary, or puſhes it by the application of his knee into its natural place.

Sometimes the *fibula* is ſeparated by ſome external violence from the thigh-bone, and is then diſtorted either upward or downward: and this generally happens, when the foot has been luxated outward; therefore, when this is the caſe, there is need of extenſion. The bone is to be firſt reſtored

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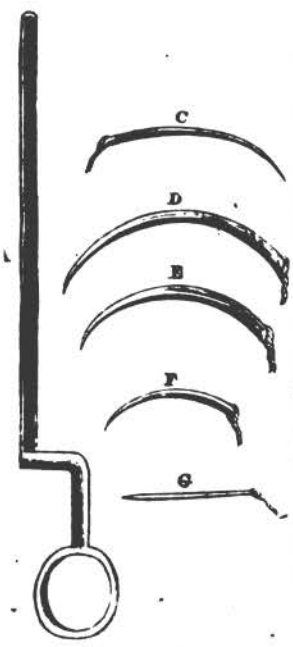
Fig. 1.

Plate CLVII



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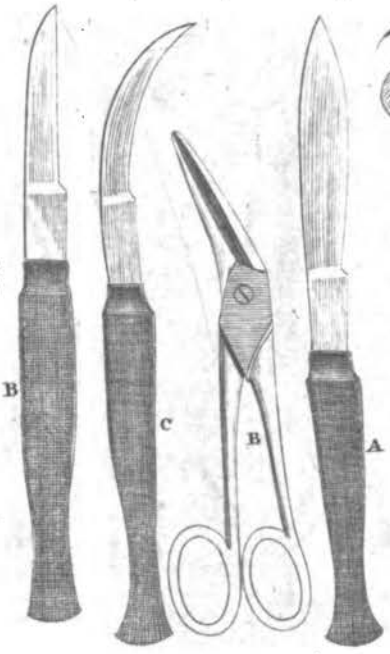

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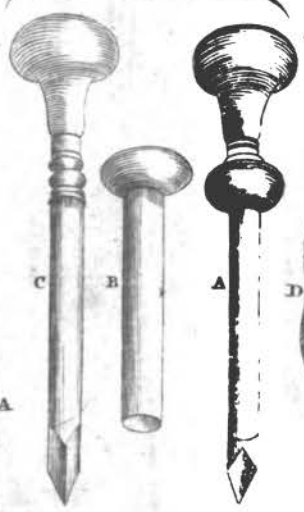

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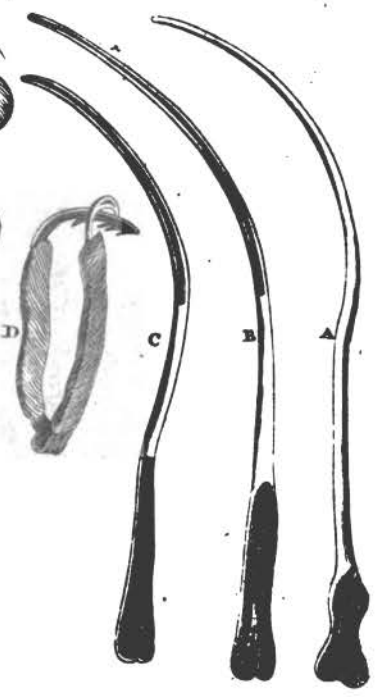

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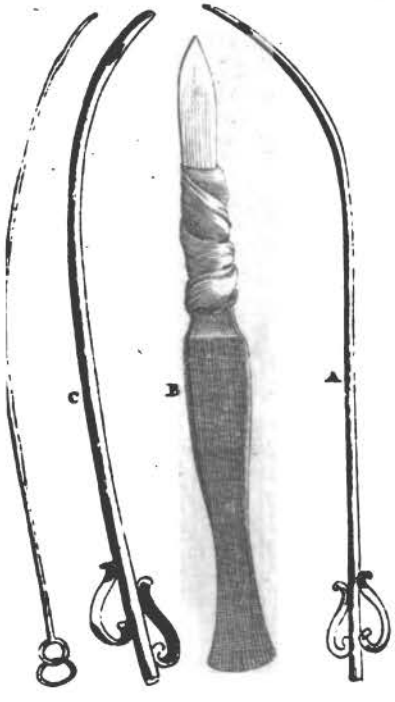

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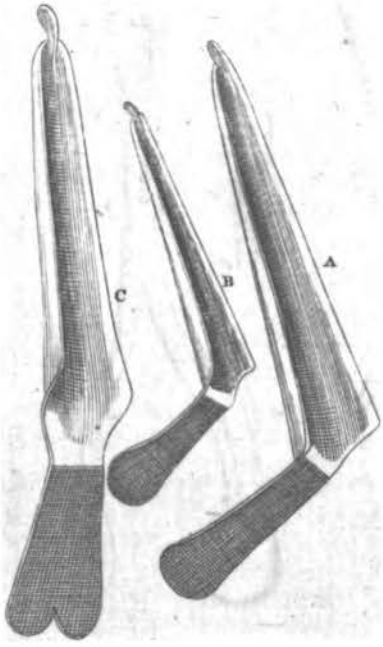

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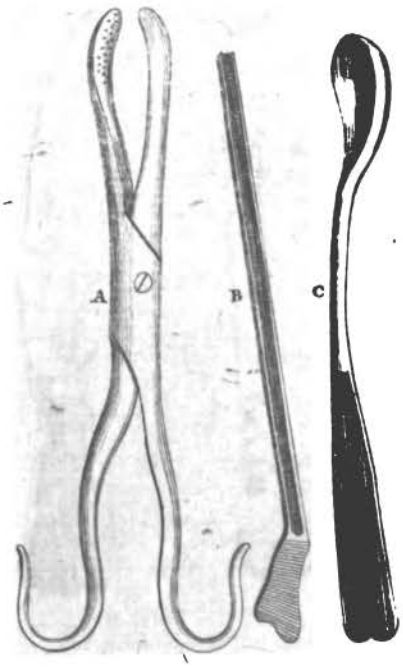

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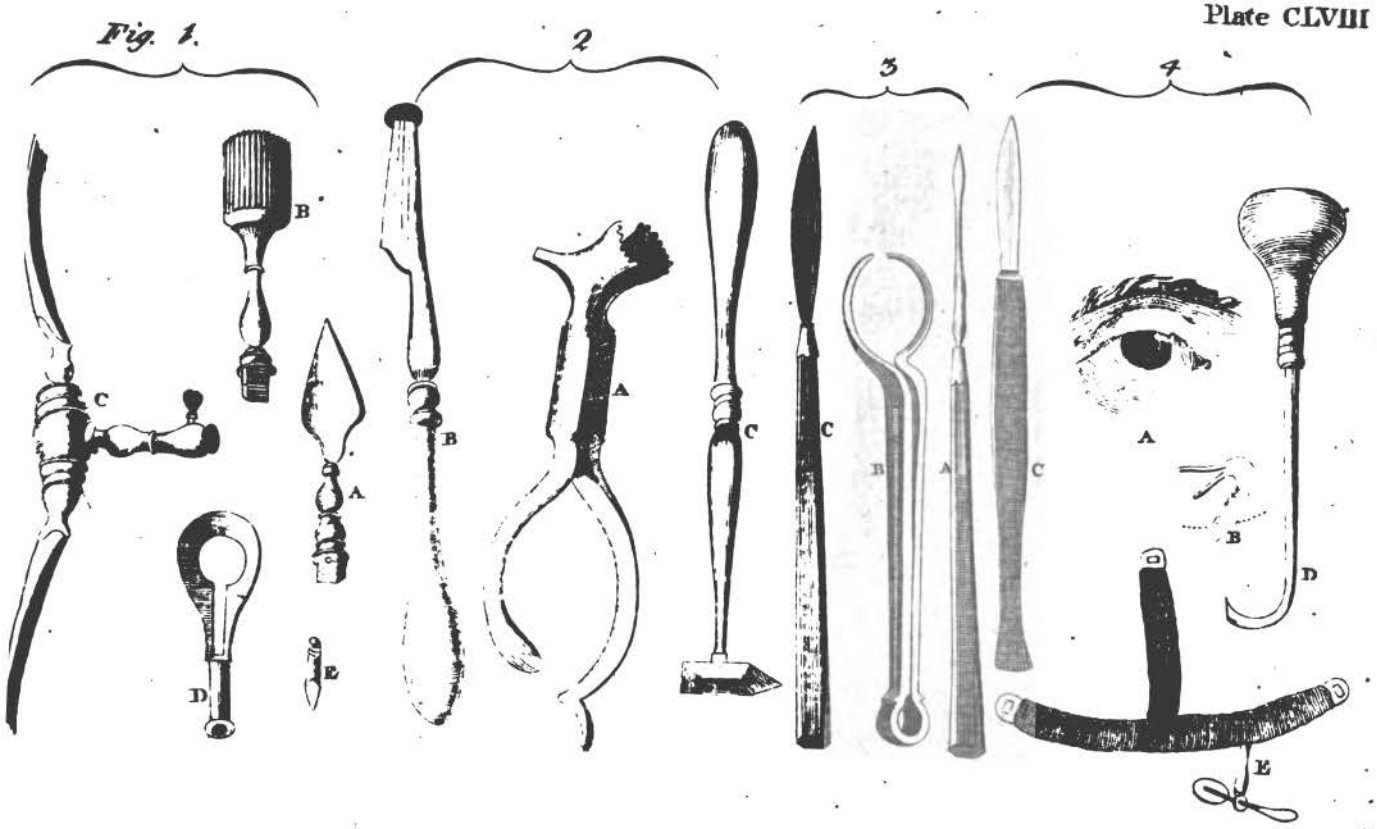

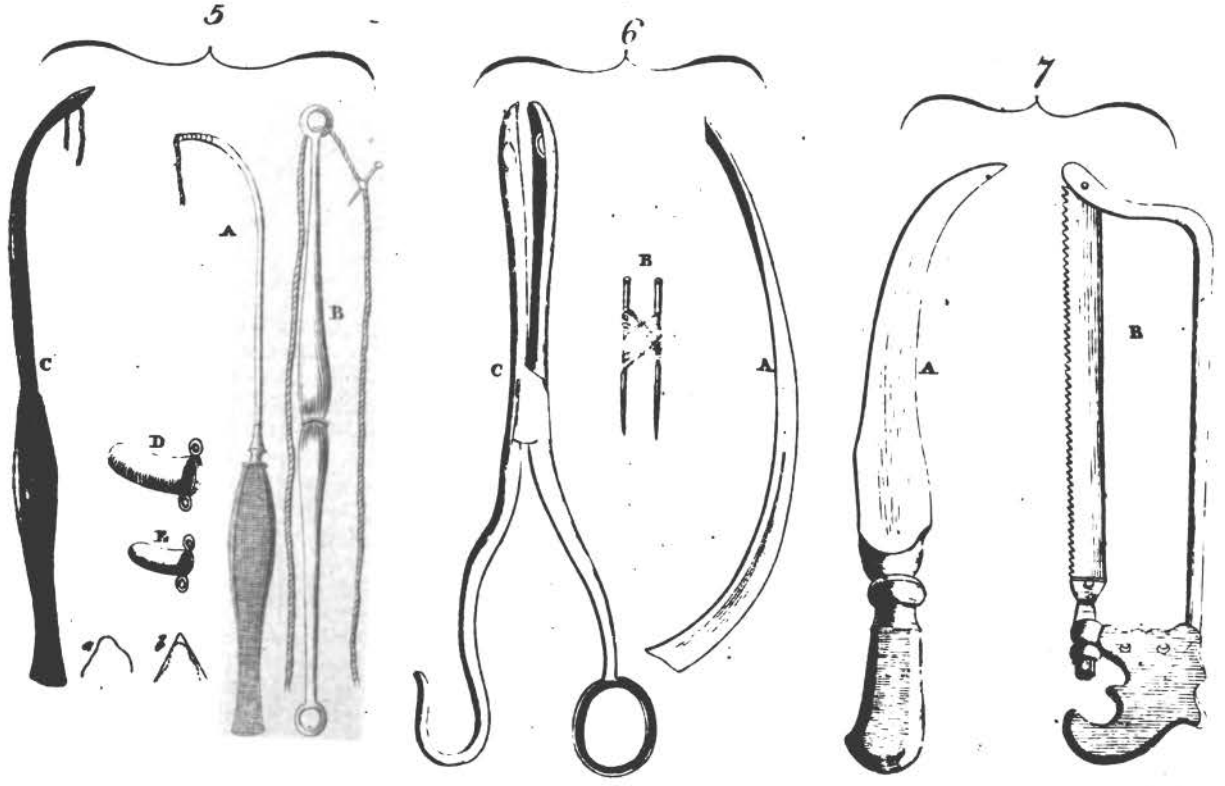

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reſtored to its natural place, and then properly bound up.

Of a Luxation *of the* Foot *and* Ancle.

The ancle may be ſometimes luxated either in jumping, running, or walking; and that in all four directions, inward, outward, backward, and forward. Which of theſe ways it happens to be luxated, may be diſcovered by the particular poſture of the joint.

The ancle is more or leſs difficult to reduce in proportion to the violence of the cauſe by which it is luxated. But the moſt ready way of reducing a luxation of the ancle is to place the patient upon a bed, ſeat, or table, letting the leg and foot be extended in oppoſite directions by two aſſiſtants, while the ſurgeon ſtrives to reduce the ancle with his hands and fingers. When the foot is by this means once replaced, it is proper to bind it up carefully, after it has been well bathed with *oxycrate* and ſalt, adviſing the patient to keep to his bed a good while, till the diſorder and its ſymptoms quite leave him.

Sometimes it happens, that only the *os calcis* or *calcaneum* is luxated by ſome external force, and that either towards the internal or external ſide of the foot. Whichever way it happens, when there is pain and inequality of the member, that is, when it has a cavity in one part, and a tumour in another, there is ſtrong reaſon to ſuppoſe a luxation: and as ſoon as it is diſcovered, the ſame method of cure is required with that before recited, keeping the limb quiet for ſome time afterwards.

Laſtly, if any other bone in the foot, the *tarſus* or *metatarſus*, ſhould happen to be luxated by ſome conſiderable external violence, the ligaments with the adjacent nerves and tendons are generally ſo affected as to excite not only moſt acute pains, but violent inflammations and convulſions; and even death itſelf has been obſerved to be the conſequence, unleſs the bones were ſpeedily replaced: it is therefore the ſafeſt way to reduce the luxations in theſe bones of the foot, by the method we before propoſed for thoſe of the hands, and that with the greateſt expedition.

S U S

SURIANA, in botany, a genus of the decandria pentagynia claſs. The calix conſiſts of ſix leaves, and the corolla of five petals; and there are five roundiſh ſeeds. There is but one ſpecies, a native of America.

URINAM, the capital of the Dutch ſettlements in Guiana, in South America: W. long. 56°, and N. lat. 6° 30′.

SURMOUNTED, in heraldry, is when one figure is laid over another. As the pile ſurmounted of a chevron in Plate CXLVII. fig. 17.

SURREPTITIOUS. See Subreptitious.

SURRY, a county of England, bounded by the river Thames, which ſeparates it from Middleſex, on the north; by Kent, on the eaſt; by Suſſex, on the ſouth; and by Berkſhire, on the weſt; being thirty-four miles long, and twenty-one broad.

SURROGATE, in law, denotes a perſon that is ſubſtituted, or appointed in the room of another.

SURSOLID, in arithmetick and algebra, the fifth power, or fourth multiplication of any number or quantity conſidered as a root. See Arithmetick, and Algebra.

SURVEYING, the art or act of meaſuring land; that is, of taking the dimenſions of any tract of ground, laying down the ſame in a map or draught, and finding the content or area thereof. See Geometry, p. 699.

SURVEYOR, a perſon who hath the overſight and care of conſiderable works, lands, or the like.

Surveyor likewiſe denotes a gauger; as alſo a perſon who ſurveys lands, and makes maps of them.

SURVIVOR, in law, ſignifies the longeſt liver of joint-tenants, or of any two perſons jointly intereſted in a thing.

SUS, in zoology, a genus of quadrupeds belonging to the order of belluæ. They have four converging fore-teeth in the upper jaw, and ſix prominent ones in the under jaw; there are two ſhort dog-teeth in the upper jaw, and one longer and jutting out in the under jaw; the ſnout is truncated, prominent, and moveable. There are five ſpecies. The ſus ſcroſa, or common ſow, is a native of the ſouthern parts of Europe. It feeds coarſely, digs up roots, &c. from the ground with its ſnout. It is a fat, ſleepy, ſtupid, dirty animal, wallowing conſtantly in the mire. The ſow brings forth a great number of young at a litter, and is therefore conſidered as a profitable animal. The fleſh, however, is not reckoned to be of the moſt wholeſome kind.

S W A

SUSDAL, a city of the province of Moſcow, in Ruſſia, one hundred miles north-eaſt of Moſcow.

SUSPENSION, or *Points of* Suspension, in mechanics, are thoſe points in the axis or beam of a balance, wherein the weights are applied, or from which they are ſuſpended. See Mechanics.

Suspension *of Arms*, in war, a ſhort truce agreed on by both armies, in order to bury the dead, wait for freſh inſtructions, or the like.

Suspension, in Scots law. See Law, Tit. xxxii. 4.

SUSSEX, a county of England, bounded by Surrey and Kent on the north, by another part of Kent on the eaſt, by the Engliſh channel on the ſouth, and by Hampſhire on the weſt: being ſixty-five miles long, and twenty-nine broad.

SUTHERLAND, a ſhire of Scotland, bounded by Caithneſs on the north, by the German ſea on the eaſt, by Roſsſhire on the ſouth, and by the Caledonian ocean on the weſt and north-weſt.

SUTTON GOLEFIELD, a market-town twenty miles north-weſt of Warwick.

SUTURE, in anatomy. See Anatomy, p. 152.

Suture, in ſurgery, a method of uniting the lips of wounds. See Surgery, p. 650.

SWABBER, an inferior officer on board ſhips of war, whoſe employment it is to ſee that the decks are kept neat and clean.

SWABIA, a circle of the German empire, bounded by Franconia and the palatinate of the Rhine on the north, by Bavaria on the eaſt, by Switzerland and Tyrol on the ſouth, and by the river Rhine, which ſeparates it from Alſatia, on the weſt; being one hundred and thirty miles long, and one hundred and ten broad.

SWALE, a river of Yorkſhire, which riſing on the confines of Weſtmorland, runs ſouth-eaſt through Yorkſhire, and falls into the Ouſe.

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SWALLOW, in ornithology. See HIRUNDO.

SWALLOW WORT, in botany. See ASCLEPIAS.

SWAN, in ornithology. See ANAS.

SWEAT, a ſenſible moiſture iſſuing out of the pores of the ſkins of animals. See PERSPIRATION.

SWEDEN, one of the moſt northerly kingdoms of Europe, bounded by Norwegian Lapland on the north, by Ruſſia on the eaſt, by the Baltic ſea on the ſouth, and by Norway on the weſt; being upwards of eight hundred miles from north to ſouth, and five hundred from eaſt to weſt.

SWEEP, in the ſea-language, is that part of the mould of a ſhip, where ſhe begins to compaſs in at the rung heads: alſo, when the hawſer is dragged along the bottom of the ſea, to recover any thing that is ſunk, they call this action ſweeping for it.

SWEET, in the wine-trade, denotes any vegetable juice, whether obtained by means of ſugar, raiſins, or other foreign or domeſtic fruit, which is added to wines, with a deſign to improve them.

SWERIN, a town of lower Saxony, in Germany, capital of the duchy of Mecklenburg, and ſituated on the lake of Swerin: in E. long. 11° 30′, and N. lat 54°.

SWERTIA, in botany, a genus of the pentandria digynia claſs. The corolla is rotated, and there are nectariferous pores at the baſes of the different laciniæ of the corolla; the capſule has one cell, and two valves. There are five ſpecies, only one of them, *viz.* the perennis, or marſh gentian, a native of Britain.

SWIMMING, the art or act of ſuſtaining the body in water, and of moving therein; in which action the air-bladder and fins of fiſhes bear a conſiderable part.

Though a great deal depends on the motion of the muſcles of the ſeveral parts of the body, in the ſwimming of the fiſh; yet the tail, and thoſe muſcles which move the lower part of the body to which it is affixed, are the great inſtruments by which their ſwift motions in the water are performed. The moving the tail, and that part of the body to which it adheres, backward and forward, or ſideways any one way, throws the whole body of the fiſh ſtrongly the contrary way; and even in ſwimming ſtraight forward, the motion and direction are both greatly aſſiſted by the vibrations of this part, as may be experienced in the motion of a boat, which, when impelled forward, may be firmly guided by means of an oar held out at its ſtern, and moved in the water as occaſion directs. The dorſal muſcles, and thoſe of the lower part of the body between the anus and tail, are the principal that are uſed in the motion of this part, and theſe are therefore the moſt uſeful to the fiſh in ſwimming. The muſcles of the belly ſeem to have their principal uſe in the contracting the belly and the air-bladder. They have been ſuppoſed of uſe to move the belly-fins; but there are too many of them for ſuch a purpoſe, and theſe fins have each its peculiar muſcle fully ſufficient to the buſineſs. The uſe of the tail in ſwimming is eaſily ſeen, by cutting it off, and committing the fiſh to the water without it, in which caſe it is a moſt helpleſs creature.

By the help of the tail they alſo turn about, by ſtriking ſtrongly with it on one ſide, and keeping it bent, ſo as to act like the rudder of a ſhip. The fins, eſpecially the pectoral ones, ſerve to keep the fiſh upright, as alſo to aſcend and deſcend.

Brutes ſwim naturally; but men attain this art by practice and induſtry. It conſiſts principally in ſtriking alternately with the hands and feet; which, like oars, row a perſon forward: he muſt keep his body a little oblique, that he may the more eaſily erect his head, and keep his mouth above water.

SWINE, in zoology. See SUS.

SWINGLING, the beating of flax or hemp. See FLAX.

SWITZ, the capital of one of the cantons of Switzerland, to which it gives name, ſituated on the eaſt ſide of the lake Lucern, ſixteen miles ſouth-eaſt of the city of Lucern: E. long. 8° 30′, and N. lat. 47°.

SWITZERLAND, or SWISSERLAND, called Helvetia by the Romans, is ſurrounded by the territories of Germany, France, and Italy, being about two hundred and ſixteen miles long, and upwards of one hundred miles broad.

SWORD, an offenſive weapon, worn at the ſide, and ſerving either to cut or ſtab: its parts are the handle, guard, and blade; to which may be added the bow, ſcabbard, pummel, *&c.*

SWORD-FISH. See XIPHIAS.

SYCAMORE-TREE, in botany. See ACER.

SYCOPHANT, an appellation given by the ancient Athenians to thoſe who informed of the exportation of figs, contrary to law; and hence it is ſtill uſed in general for all informers, paraſites, flatterers, cheats, *&c.*

SYLLABLE, in grammar, a part of a word, conſiſting of one or more letters, pronounced together.

SYLLABUS, in matters of literature, denotes a table of contents, or an index of the chief heads of a book or diſcourſe.

SYLLOGISM, in logic, an argument or term of reaſoning, conſiſting of three propoſitions; the two firſt of which are called premiſſes, and the laſt the concluſion. See LOGIC, p. 991.

SYMBOL, a ſign or repreſentation of ſomething moral, by the figures or properties of natural things.

Hence ſymbols are of various kinds, as hieroglyphics, types, ænigmas, parables, fables, *&c.*

Among Chriſtians, the term ſymbol denotes the Apoſtles creed.

SYMMETRY, the juſt proportion of the ſeveral parts of any thing, ſo as to compoſe a beautiful whole.

SYMPATHETIC, ſomething that acts, or is acted on, by ſympathy: thus we ſay, ſympathetic diſeaſes, inks, powders, *&c.*

SYMPATHY, in medicine, denotes an indiſpoſition befalling one part of the body, through the defect or diſorder of another; whether it be from the affluence of ſome humour, or vapour ſent from elſewhere; or from the want of the influence of ſome matter neceſſary to its action.

SYMPHONY, in muſick, properly denotes a conſonance or concert of ſeveral ſounds agreeable to the ear, whether vocal or inſtrumental, called alſo harmony.

SYMPHYSIS, in anatomy. See ANATOMY, p. 148.

SYMPHYTUM, in botany, a genus of the pentandria monogynia claſs. The limbus of the corolla is tubular and ſomewhat ventricoſe, the fauces being cloſed with ſubulated radii. There are three ſpecies, only one of them, *viz.* the officinale, or comfrey, a native of Britain. The root of the comfrey is a fine mucilage.

SYMPOSIARCH, in antiquity, the director, or manager of an entertainment. This office was ſometimes performed by the perſon at whoſe charge the entertainment was provided;

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provided; ſometimes by another named by him; and at other times, eſpecially in entertainments provided at the common expence, he was elected by lot, or by the ſuffrages of the gueſts.

SYMPTOM, in medicine, any appearance in a diſeaſe, which ſerves to indicate or point out its cauſe, approach, duration, event, *&c.*

SYMPTOMATICAL in medicine, is a term often uſed to denote the difference between the primary and ſecondary cauſes in diſeaſes: thus a fever from pain is ſaid to be ſymptomatical, becauſe it riſes from pain only.

SYNÆRESIS, contraction, in grammar, a figure whereby two ſyllables are united in one; as *vemens* for *vehemens*.

SYNAGOGUE, a particular aſſembly of Jews met to perform the offices of their religion. Alſo the place wherein they meet.

SYNALOEPHA, in grammar, a contraction of ſyllables, performed principally by ſuppreſſing ſome vowel or diphthong at the end of a word, on account of another vowel or diphthong at the beginning of the next. As *ill' ego*, for *ille ego*, &c.

SYNARTHROSIS, in anatomy. See ANATOMY, p. 148.

SYNCHONDROSIS, in anatomy. See ANATOMY, p. 148.

SYNCHRONISM, denotes the happening of ſeveral things in the ſame time.

SYNCOPATION, in muſick, denotes a ſtriking or beating of time, whereby the diſtinction of the ſeveral times or parts of the meaſure is interrupted.

SYNCOPE, FAINTING, in medicine, a deep and ſudden ſwooning, wherein the patient continues without any ſenſible heat, motion, ſenſe, or reſpiration, and is ſeized with a cold ſweat over the whole body, and all the parts turn pale and cold as if dead. See MEDICINE, p. 157.

SYNCOPE, in grammar, an eliſion or retrenchment of a letter or ſyllable out of the middle of a word, as *caldus* for *calidus*.

SYNDIC, in government and commerce, an officer in divers countries intruſted with the affairs of a city, or other community, who calls meetings, makes repreſentations and ſolicitations to the miniſtry, magiſtracy, *&c.* according to the exigency of the caſe.

SYNDROME, a word introduced into medicine by the empirics, who mean by it a concourſe of ſymptoms.

SYNECDOCHE, in rhetoric, a kind of trope, frequent among orators and poets. There are three kinds of ſynecdoches. By the firſt, a part is taken for the whole; as the point for the ſword, the roof for the houſe, the ſails for the ſhip, *&c.* By the ſecond, the whole is uſed for a part. By the third, the matter whereof the thing is made is uſed for the thing itſelf; as ſteel for ſword, ſilver for money, *&c.* To which may be added another kind, when the ſpecies is uſed for the genus, or the genus for the ſpecies.

SYNECDOCHE, in Greek and Latin grammar, is when the ablative of a part or an adjunct of a ſentence is changed into the accuſative.

SYNECPHONESIS, in grammar, a coalition whereby two ſyllables are pronounced as one.

SYNGENESIA, in botany. See BOTANY. p. 635.

SYNNEUROSIS, in anatomy See ANATOMY, p. 148.

SYNOCHUS, or SYNOCHA, in medicine, a continual fever, without any remiſſion. See MEDICINE, p 79.

SYNOD, in aſtronomy, a conjunction, or concourſe of two or more ſtars, or planets, in the ſame optical place of the heavens.

SYNOD, ſignifies alſo a meeting, or aſſembly of eccleſiaſtical perſons, concerning matters of religion.

SYNODALS, were pecuniary rents, commonly of two ſhillings, paid to the biſhop, or archdeacon, at the time of their Eaſter viſitation, by every pariſh prieſt.

SYNODICAL, ſomething belonging to a ſynod: thus ſynodical epiſtles are circular letters written by the ſynods to the abſent prelates and churches, or even thoſe general ones directed to all the faithful, to inform them of what had paſſed in the ſynod.

SYNOECIA, in Grecian antiquity, a feaſt celebrated at Athens, in memory of Theſeus's having united all the petty communities of Attica into one ſingle commonwealth, the ſeat whereof was Athens, where all the aſſemblies were to be held. This feaſt was dedicated to Minerva; and, according to the ſcholiaſt of Thucydides, it was held in the month Metagitnion.

SYNONYMOUS, is applied to a word or term that has the ſame import or ſignification with another.

SYNOVIA, in medicine, a term uſed by Parcelſus, and his ſchool, for the nutricious juice proper and peculiar to each part; thus they talk of the ſynovia of the joints, of the brain, *&c.*

SYNTAX, in grammar, the proper conſtruction, or due diſpoſition of the words of a language, into ſentences, or phraſes. See GRAMMAR.

SYNTEXIS, in medicine, an attenuation, or colliquation of the ſolids of the body, ſuch as frequently happens in atrophies, inflammations of the bowels.

SYNTHETIC, or SYNTHETICAL is, according to Dr. Shaw, a term given to that part of chemiſtry, which, after the analytical chemiſtry has taken bodies to pieces, or reduced them to their principles, can, from theſe ſeparated principles, either recompound the ſame body again, or, from the mixtures of the principles of one or more bodies in various manners, form a large ſet of new productions, which would have been unknown to the world but for this art: ſuch productions are brandy, ſoap, glaſs, and the like.

SYNUSIASTS, a ſect of heretics, who maintained, that there was but one nature and one ſingle ſubſtance in Jeſus Chriſt.

SYRACUSE, a city and port-town of Sicily, in the province of Val de Noto, ſituated on a fine bay of the Mediterranean ſea, on the eaſt coaſt of the iſland: in E. long 15° 5′, N lat. 37° 25′.

SYRIA, a part of Aſiatic Turky, bounded by Natolia and Turcomania, on the north; by Diarbec or Meſopotamia on the eaſt; by Arabia and Paleſtine on the ſouth; and by the Levant ſea on the weſt. The Turks divide Syria into three beglerbeglies, or vice-royalties, *viz* thoſe of Aleppo, Tripoli, and Damaſcus, or Scham, the ſeats of the reſpective viceroys

SYRINGA, in botany, a genus of the diandria monogynia claſs. The corolla conſiſts of four ſegments, and the capſule has two cells. There are two ſpecies, both natives of Perſia.

SYRINGE, a well known inſtrument, ſerving to imbibe or ſuck in a quantity of fluid, and to ſquirt or expel the ſame with violence.

A ſyringe is only a ſingle pump, and the water aſcends in-

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in it on the ſame principle as in the common ſucking pump. See HYDROSTATICS, p. 808.

SYRUP, in pharmacy, a ſaturated ſolution of ſugar, made in vegetable decoctions, or infuſions.

SYSSARCOSIS, in anatomy. See ANATOMY, p. 148.

SYSTEM, in general, denotes an aſſemblage or chain of principles and concluſions, or the whole of any doctrine, the ſeveral parts whereof are bound together and follow or depend on each other; in which ſenſe we ſay, a ſyſtem of philoſphy, a ſyſtem of divinity, *&c.*

SYSTOLE, in anatomy, the contraction of the heart, whereby the blood is drawn out of its ventricles into the arteries; the oppoſite ſtate to which is called the diaſtole, or dilatation of the heart.

SYSTYLE, in architecture, that manner of placing columns where the ſpace between the two fuſts conſiſt of two diameters, or four modules.

SYZYGY, in aſtronomy, a term equally uſed for the conjunction and oppoſition of a planet with the ſun. See ASTRONOMY.

T.

TAB

TABAGO, one of the Caribbee iſlands in the American ocean, one hundred and twenty miles ſouth of Barbadoes: W. long. 59°, N. lat. 11° 30′.

TABARCA, an iſland on the coaſt of Barbary, in Africa, fifty miles weſt of Tunis: E. long. 8°, N. lat. 36° 30′.

TABASCO, the capital of a province of the ſame name, ſituated on the bay of Campeachy, at the mouth of the river tabaſco, one hundred and ſixty miles ſouth-weſt of Campeachy: W long. 95°. N. lat. 18°.

TABBY, in commerce, a kind of rich ſilk which has undergone the operation of tabbying. See the next article.

TABBYING, the paſſing a ſilk or ſtuff under a calender, the rolls of which are made of iron or copper, variouſly engraven, which bearing unequally on the ſtuff renders the ſurface thereof unequal, ſo as to reflect the rays of light differently, making the repreſentation of waves thereon.

TABELLA, TABLET, in pharmacy, is much the ſame with troches and lozenges, being a ſolid preparation formed into a little cake, or maſs, of different figures, intended to diſſolve ſlowly, and generally made agreeable to the palate.

TABELLIO, in the Roman law, an officer or ſcrivener, much the ſame with our notaries-public, who are often called tabelliones in our ancient law-books.

TABERNACLE, among the Hebrews, a kind of building, in the form of a tent, ſet up, by expreſs command of God, for the performance of religious worſhip, ſacrifices, *&c.* during the journeying of the Iſraelites in the wilderneſs; and, after their ſettlement in the land of Canaan, made uſe of for the ſame purpoſe till the building of the temple of Jeruſalem. It was divided into two parts, the one covered, and properly called the tabernacle; and the other open, called the court. The curtains which covered the tabernacle were made of linen, of ſeveral colours, embroidered. There were ten curtains, twenty-eight cubits long and four in breadth. Five curtains faſtened together made up two coverings, which covered all the tabernacle. Over theſe there were two other coverings; the one of goat-hair, and the other of ſheep-ſkins. The holy of holies was parted from the reſt of the tabernacle by a curtain made faſt to four pillars, ſtanding ten cubits from the end. The length of

TAB

the whole tabernacle was thirty-two cubits, that is, about fifty feet; and the breadth twelve cubits, or nineteen feet. The court was a ſpot of ground one hundred cubits long, and fifty in breadth, incloſed by twenty columns, each twenty cubits high and ten in breadth, covered with ſilver, and ſtanding on copper baſes, five cubits diſtant from one another; between which, there were curtains drawn, and faſtened with hooks. At the eaſt end was an entrance twenty cubits wide, covered with a curtain hanging looſe.

Feaſt of TABERNACLES, a ſolemn feſtival of the Hebrews, obſerved after harveſt, on the fifteenth day of the month Tiſri, inſtituted to commemorate the goodneſs of God, who protected the Iſraelites in the wilderneſs, and made them dwell in booths, when they came out of Egypt. On the firſt day of the feaſt, they began to erect booths of the boughs of trees, and in theſe they were obliged to continue ſeven days. The booths were placed in the open air, and were not to be covered with cloths, nor made too cloſe by the thickneſs of the boughs; but ſo looſe that the ſun and the ſtars might be ſeen, and the rain deſcend through them

TABERNÆMONTANA, in botany, a genus of the pentandria monogynia claſs. It has two horizontal follicles; and the ſeeds are pulpous. There are three ſpecies, all natives of America.

TABES, or CONSUMPTION. See MEDICINE, p. 103.

TABLATURE, in muſick, is, in general, when, to expreſs the ſounds or notes of a compoſition, we uſe the letters of the alphabet, or any other characters not uſed in the modern muſick.

Laws of the twelve TABLES, were the firſt ſet of laws of the Romans, thus called, either by reaſon the Romans then wrote with a ſtyle on thin wooden tablets covered with wax; or rather, becauſe they were engraven on tables, or plates of copper, to be expoſed in the moſt noted part of the public forum. After the expulſion of the kings, as the Romans were then without any fixed or certain ſyſtem of law, at leaſt had none ample enough to take in the various caſes that might fall between particular perſons, it was reſolved to adopt the beſt and wiſeſt laws of the Greeks. One Hermodorus was firſt appointed

to

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to tranſlate them, and the decemviri afterwards compiled and reduced them into ten tables. After a world of care and application, they were at length enacted and confirmed by the ſenate and an aſſembly of the people, in the year of Rome 303. The following year they found ſomething wanting therein, which they ſupplied from the laws of the former kings of Rome, and from certain cuſtoms which long uſe had authoriſed: all theſe being engraven on two other tables, made the laws of the twelve tables, ſo famous in the Roman juriſprudence, the ſource and foundation of the civil or Roman law.

TABLES *of the law*, in Jewiſh antiquity, two tables on which were written the decalogue, or ten commandments, given by God to Moſes on Mount Sinai. See DECALOGUE.

TABLE, in mathematics, a ſyſtem of numbers calculated to be ready at hand for the expediting aſtronomical, geometrical, and other operations.

Aſtronomical TABLES, are computations of the motions, places, and other phænomena of the planets.

TABORITES, a branch or ſect of the ancient Huſſites. They carried the point of reformation farther than Huſs had done, rejected purgatory, auricular confeſſion, the unction of baptiſm, tranſubſtantiation, *&c.* They reduced the ſeven ſacraments of the Romaniſts to four, *viz.* baptiſm, the euchariſt, marriage, and ordination.

TABRISTAN, a province of Perſia, ſituated on the northern ſhore of the Caſpian ſea, having the province of Aſtrabat on the eaſt, and Gilan on the weſt; being part of the ancient Hyrcania.

TACAMAHACA, in pharmacy, a ſolid reſin, improperly called a gum, in the ſhops: it is of a fragrant and peculiar ſmell, and is of two kinds; the one called the ſhell-tacamahaca, which is the fineſt; the other, which is an inferior kind, being termed rough-tacamahaca, or tacamahaca in grains.

Some greatly commend tacamahaca in diſorders of the breaſt and lungs; but, at preſent it is very rarely uſed internally. Externally, however, it is in repute for ſoftening tumours, and mitigating pain and aches.

TACK, in a ſhip, a great rope having a wale-knot at one end, which is ſeized or faſtened into the clew of the ſail; ſo is reefed firſt though the cheſſe-trees, and then is brought through a hole in the ſhip's ſide. Its uſe is to carry forward the clew of the ſail, and to make it ſtand cloſe by a wind: and whenever the ſails are thus trimmed, the main-tack, the fore-tack, and mizen-tack, are brought cloſe by the board, and haled as much forward on as they can be.

TACK, in Scots law. See LAW, Tit. xiii. 8, *&c.*

TACK-ABOUT, in the ſea-language, is to turn the ſhip about, or bring her head about, ſo as to lie the contrary way.

TACKLE, among ſea-men, denotes all the ropes or cordage of a ſhip, uſed in managing the ſails, *&c.*

TACTICS, in the art of war, is the method of diſpoſing forces to the beſt advantage in order of battle, and of performing the ſeveral military motions and evolutions.

TADCASTER, a market-town of Yorkſhire, ten miles ſouth-weſt of York.

TADORNA, in ornithology. See ANAS.

TADPOLE, a young frog, before it has diſengaged itſelf from the membranes that envelope it in its firſt ſtage of life. See RANA.

TÆNIA, in zoology, a genus of inſects, belonging to the order of vermes zoophyta; the body of which is of an oblong form, and compoſed of evident joints or articulations, in the manner of the links of a chain, with a mouth and viſcera in each joint; ſo that the joints, which are exceedingly numerous, are in ſome meaſure ſo many diſtinct animals, and can live independent of each other. There are four ſpecies; the ſolium, or tape-worm, is found in the bowels of men, and fiſhes, and frequently extends to many yards in length. See MEDICINE, p. 160.

TÆNIA, in architecture, a member of the Doric capital, reſembling a ſquare fillet, or reglet: it ſerves inſtead of a cymatium.

TAFFETY, in commerce, a fine ſmooth ſilken ſtuff, remarkably gloſſy.

TAGETES, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is naked; the pappus has five ſtraight awns; the calix conſiſts of one tubulous leaf with five teeth; and there are five perſiſtent floſcules in the radius. The ſpecies are three, all natives of America.

TAGUS, the largeſt river of Spain; which, taking its riſe on the confines of Arragon, runs ſouth-weſt through the provinces of New Caſtile and Eſtremadura; and paſſing by the cities of Aranjuez, Toledo, and Alcantara, and then croſſing Portugal, forms the harbour of Liſbon, at which city it is about three miles over; and about eight or ten miles below this, it falls into the Atlantic ocean.

TAJACU, in zoology, a ſpecies of hog. See SUS.

TAIL, the train of a beaſt, bird, or fiſh; which, in land animals, ſerves to drive away flees, *&c.* and in birds and fiſhes, to direct their courſe, and aſſiſt them in aſcending or deſcending in the air or water.

TAILZIE, in Scots law. See LAW, Tit. xxvii. 8, *&c.*

TAINE, a port-town of Roſs-ſhire, in Scotland, ſituated on the ſouth-ſide of the frith of Sutherland, ſeven miles north of Cromarty: W. long. 3° 38′, N. lat. 58°.

TALC, in natural hiſtory, a large claſs of foſſil bodies, compoſed of broad, flat, and ſmooth laminæ or plates, laid evenly and regularly on one another; eaſily fiſſile, according to the ſite of theſe plates, but not all ſo in any other direction; flexile, and elaſtic; bright, ſhining, and tranſparent; not giving fire with ſteel, nor fermenting with acid menſtrua, and ſuſtaining the force of a violent fire without calcining.

TALENT, money of account among the ancients.

Among the Jews, a talent in weight was equal to 60 maneh, or 113 lb. 10 oz. 1 dwt. $10\frac{3}{7}$ gr.

TALIO, *lex talionis*, a ſpecies of puniſhment in the Moſaic law, whereby an evil is returned ſimilar to that committed againſt us by another; hence that expreſſion, eye for eye, tooth for tooth.

TALISMANS, magical figures cut or engraved with ſuperſtitious obſervations on the characteriſms and configurations of the heavens, to which ſome aſtrologers have attributed wonderful virtues, particularly that of calling down celeſtial influences. The taliſmans of Samothrace, ſo famous of old, were pieces of iron formed into certain images, and ſet in rings; theſe were eſteemed preſerva-

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tives againſt all kinds of evils. There were likewiſe taliſmans taken from vegetables, and others from minerals.

TALLOW, in commerce, the fat of certain animals, melted down and clarified, ſo as to be fit for making candles, *&c.*

TALLOW-TREE, a remarkable tree growing in great plenty in China; ſo called, from its producing a ſubſtance like tallow, which ſerves for the ſame purpoſe: it is about the height of a cherry-tree, its leaves in form of a heart, of a deep ſhining red colour, and its bark very ſmooth. Its fruit is incloſed in a kind of pod, or cover, like a cheſnut, and conſiſts of three round white grains, of the ſize and form of a ſmall nut, each having its peculiar capſula, and within a little ſtone. This ſtone is encompaſſed by a white pulp which has all the properties of true tallow, both as to conſiſtence, colour, and even ſmell; and accordingly the chineſe make their candles of it; which would doubtleſs be as good as thoſe in Europe, if they knew how to purify their vegetable, as well as we do our animal, tallow.

TALLY, a piece of wood cut in two parts, whereon accounts were anciently kept, by means of notches; one part of the tally being kept by the debtor, and the other by the creditor.

TALMUD, among the Jews, a collection of the doctrines of their religion and morality. It is the *corpus juris*, or body of the laws and cuſtoms of the Jews, who eſteem it equal to the ſcriptures themſelves.

TALPA, in zoology, a genus of quadrupeds belonging to the order of feræ. There are ſix fore-teeth in the upper-jaw, and eight in the under-jaw; they have one large dog-tooth, and four ſmaller ones. There are two ſpecies, *viz.* the caudata, or common mole, with a tail, and five toes on the feet; it is a native of Europe, feeds upon worms, and, by raiſing the earth, infeſts gardens and cultivated grounds. This animal has a penis much longer, in proportion to the ſize of its body, than any other creature. The fur is exceedingly ſmooth and fine. Though generally believed to be blind, it has a couple of ſmall eyes moſtly hid with hair. 2. The aſcatica has no tail, and but three toes on its feet. It is a native of Siberia.

TAMANDAU, in zoology. See MYRMECOPHAGA.

TAMARINDUS, in botany, a genus of the triandria monogynia claſs. The calix conſiſts of four ſegments, and the corolla of three petals; the nectarium conſiſts of two ſhort briſtles under the filaments; and the pod is pulpy. There is but one ſpecies, a native of Ægypt, Arabia, *&c.*

The pod is made up of a double rind, or membrane, between which is a pulpy matter; which taken in the quantity of two or three drams, or an ounce or more, proves gently laxative or purgative; and at the ſame time, by its acidity, quenches thirſt, and allays immoderate heat.

TAMARIX, in botany, a genus of the pentandria trigynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals: the capſule has one cell, and three valves; and the ſeeds are pappous. There are two ſpecies, none of them natives of Britain.

The bark and leaves of the tamarix-tree are moderately aſtringent.

TAMBAC, a mixture of gold and copper, which the people of Siam hold more beautiful, and ſet a greater value on, than gold itſelf.

TAMUS, in botany, a genus of the dioecia hexandria claſs. The calix of both male and female conſiſts of ſix ſegments; neither of them have any corolla; the ſtylus is trifid; and the berry has three cells, containing two ſeeds. There are two ſpecies, none of them natives of Britain.

TAMWORTH, a borough of Staffordſhire, ſituated twenty miles ſouth-eaſt of Stafford. It ſends two members to parliament.

TAN, the bark of the oak, chopped and ground in a tanning-mill into a coarſe powder, to be uſed in the tanning of leather. See TANNING.

TANACETUM, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is naked; and the calix is hemiſpherical and imbricated. There are eight ſpecies, only one of them, *viz.* the vulgare, or common tanſy, a native of Britain.

Tanzy, conſidered as a medicine, is a moderately warm bitter, and is much extolled by ſome in hyſteric complaints, eſpecially if proceeding from a deficiency or ſuppreſſion of the uterine purgations: its ſeeds and leaves have been in conſiderable eſteem as anthelmintics; and are ſaid to be good in colics and flatulencies.

TANGENT of an arch is a right-line drawn perpendicularly from the end of a diameter, paſſing to one extremity of the arch, and terminated by a right-line drawn from the centre through the other end of the arch, and called the ſecant. See GEOMETRY.

TANGIER, a port-town of Africa, in the empire of Morocco and kingdom of Fez, ſituated at the entrance of the ſtraits of Gibraltar, in W. long. 7°, N. lat. 35° 40′. It was the capital of the ancient Mauritania Tingitana, and was once in the poſſeſſion of the Engliſh.

TANGUT, a province of Chineſian Tartary, ſituated north-weſt of the great wall which divides Tartary from China.

TANJOUR, a city of the hither India, capital of a province of the ſame name, ſituated E. long. 79°, N. lat. 11° 30′.

TANNER, one who dreſſes hides, *&c.* by tanning them. See the next article.

TANNING.

TANNING is the art of preparing raw hides or ſkins for the hand of the currier; or for immediate uſe, without any further operation.

The firſt part of this definition includes all leather uſed for the upper part of ſhoes, coaches, coach-harneſs, ſadler-leather, *&c.* and the laſt, the manufacture of bin or backs, *&c.*

We ſhall firſt give a general account of the proceſs of marn-

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manufacturing leather comprehended under the firſt part of the definition; and then explain ſeparately the particular operations comprehended under the general proceſs.

When the hide or ſkin is received raw from the hand of the butcher, it is thrown into a water-dub or other piece of water, to cleanſe it from the blood and gore; after which, the horns and tail are cut off: then it is put into the lime, and wrought there according to the directions given below; from thence it is wrought into the bait, and cleanſed there from the lime, *&c.* It is next transferred to the ooze; and when properly filled, according to the directions on that head, it is conveyed to the tann-pit, where it is tanned; which finiſhes the proceſs.

Before we proceed, it will be neceſſary to give a ſhort view of the nature and ſtructure of leather, which will contribute to explain the reaſon of the different operations it paſſes through.

All hides or ſkins, when received from the hand of the butcher, are a bundle of connected tubes, ſomewhat reſembling a honey-comb fixed on a baſis; on the fleſh-ſide, of an extreme cloſe texture; but all open on the hair or grain ſide. Theſe tubes contain a fatty or mucilaginous kind of matter; which, if allowed to remain in a fluid ſtate, would corrupt the leather, and, if dried in the hide, would not only occaſion a criſp or hardneſs in the leather, and be eaſily ſoftened by moiſture; but would alſo, in the courſe of tanning, in a great meaſure oppoſe every ſubſtance that can be applied to conſolidate and preſerve the hide from corruption.

To extract this matter; to ſwell and expand the pores as much as they can bear, without a diſunion of parts, in order to increaſe the thickneſs, and the more eaſily to re-fill or introduce a matter leſs ſubject to changes from drought and moiſture; to preſerve the fibres that compoſe the leather from putrefaction; and to conſolidate the whole into one durable maſs; are the ends propoſed by the ſeveral operations of tanning.

Of Liming.

The extraction of the matter contained in the pores being the firſt aim of the tanner, the firſt ſtep is to open and expand the fibres, that the matter may be the more eaſily ejected, in order to give room for the ſubſequent reception of the tan. This is done by common ſlacked lime infuſed in water, and is made up in a pit built with ſtone, of a length ſufficient to contain a midling hide, but ſeldom ſo broad as to allow it to lie at its full breadth. The hides are generally treated in the lime in the following manner. They are thrown into a lime-dub, of a weak or ſlack conſiſtence at firſt; where they are drawn out and thrown in twice or thrice every day, for a few days. They are then conveyed to a lime of a ſtronger quality, and drawn as before, though perhaps not ſo often; once in a day, or once in two days when they are further advanced, may ſuffice. After they have lain there for ten or fourteen days, the ſtrength of the lime may be increaſed, or they may be carried to one of a ſtronger nature, where they are drawn and returned as before till they be completely limed.

As the haſtening and retarding the operation in particular caſes may be neceſſary; and as it is material for the quality of the leather, that the lime ſhould make an equal impreſſion upon the hide; or rather, if poſſible, that the weaker parts ſhould be ſaved, and the ſtronger more expoſed; the following obſervation may be of uſe. In moſt yards there are from 20 to 40 hides or upwards wrought in a lime at a time. When theſe hides are all thrown in, they muſt neceſſarily be made to lie ſpread out upon one another, as cloſe as poſſible, to take up little room. By this means thoſe that are near the bottom of the pit will be ſqueezed ſo cloſely together by the preſſure of the ſuperior hides, that the water, the medium by which the lime is communicated to them, will be almoſt entirely excluded from acting upon the body of the hide, while the bellies and other outer ſkirts will be expoſed to its full force. For this reaſon, it is neceſſary to change their poſition often, that the different parts of the hides may have nearly the ſame opportunity of being impregnated with the lime: and in this view, ſince drawing in the limes is neceſſary, it is alſo evident, that no prejudice can accrue to the leather from the frequent repetition of it, but may be greatly hurt if it is neglected. The often drawing of leather muſt not only bring on the operation more equally, but muſt at the ſame time quicken the effect of the lime, as the expoſure of the hide to the air and lime by turns will give it an opportunity of acting with greater force. Beſides, the workman has it in his power, every time the dub is drawn, either to add new ſtrength to it (if neceſſary) by giving more lime, or to make it exert the ſtrength it already poſſeſſes by ſtirring or raiſing the lime from the bottom. Thus the workman has it greatly in his power to accelerate or retard the operation as he ſhall think proper. Small leather ought to be drawn oftener than large, as it is not ſo able to reſiſt the ſtrength of the lime. During very hot weather the lime will operate more quickly than in cold: therefore the workman ought to pay a ſtrict attention to the ſtate of his limes at that time, and draw oftener. The rays of the ſun, if allowed to act any time on the leather when it is in the draught, will greatly hurt it.

From the above hints, the workman will be enabled to form ſome judgment how to vary his work according to the different circumſtances that may occur. And here it would ſeem requiſite, that ſome directions ſhould be given for knowing when the leather is ſufficiently limed. But it is impoſſible to convey ideas in an intelligible manner by words, which can only be acquired by practice and frequent obſervation. Only we may obſerve in general, as the hide becomes limed, it leaves the original raw fleſhy appearance, has more of the appearance of being boiled, and becomes more plump and ſpungy. But all theſe appearances are the more viſible in proportion as the leather is over-done; and therefore it would be extremely dangerous for a perſon without experience to truſt to the above marks. However, though the time taken to perform this operation may be much varied; yet the ordinary time for a middling hide is from 4 to 6 weeks, and ſo in proportion for larger and ſmaller leather.

Of Baiting, *and other work before* Oozing.

The hide is now ſtript of its hair, and all the ſlimy fatty ſtuff ſeparated from the leather that is found adhering to the fleſh-ſide; the firſt of which operations is called hairing, and the laſt fleſhing. After which, as it is the workman's aim to diſcharge the matter contained in the pores of the leather, as alſo the particles of lime that may have inſinuated themſelves during the liming; and as the lime will be found to have communicated a degree of elaſticity to the fibres, and a tenacious quality to the matter; it is neceſſary to unbrace and relax the fibres, and bring the matter

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to be ejected into a greater ſtate of fluidity before we attempt to repel it. An infuſion of hen or pigeon dung and water, (which is called a bait,) has been found to be the moſt effectual thing for anſwering the above end. Into this infuſion the hides are thrown promiſcuouſly, where they are drawn in the ſame manner as directed in the article of liming; and in proportion to the draughts given, the ſtrength of the leather, trim of the bait, &c. the workman will find his point gained from 4 to 8 days: he will find the leather reduced to a ſoft mellow conſiſtence without any corruption or decay of parts, the matter more fluid and leſs tenacious, and eaſily ſeparable from the hide upon working it on the beam with the tanners knife: but as once working cannot purify the hide, the workman muſt ſoak it in water, and work it on the beam, alternately, ſuch a number of times as his judgment ſhall direct, in order to purge it thoroughly; and as it was obſerved before, that all the pores of the leather were open on the grain-ſide, moſt of the work ſhould be applied on that ſide. As a putrefaction or corruption of the parts, or an extention of the fibres beyond their proper tone, can never be remedied when once begun, the over-doing or undue management either in baiting or liming, muſt be equally fatal. To obtain the ends propoſed by theſe two operations, and at the ſame time to guard againſt their bad effects, require more experience and knowledge in the nature of leather than any other operation it has afterwards to go through.

Of Oozing.

The hide, when ready for the ooze, ought to be nothing but a bundle of empty tubes void of all fluid matter; that is, compoſed of nothing but what is called the ſolids of the hide, without any decay or corruption.

It is now the tanner's buſineſs to fill theſe tubes or pores with a more durable matter, in order to ſupport the fabrick of the leather; which is the end of oozing. A number of different ſubſtances have been tried for this purpoſe; but none are equal to oak-bark. This bark, after it is thoroughly dried, is pounded, or rather bruiſed with a mill or other inſtrument; the powder is ſifted out for the purpoſe of making up oozes, which is only an infuſion of this powder in common water; an old or exhauſted ooze (if not begun to corrupt) may be renewed by adding more bark, according to the ſtrength of the ooze required. This liquor is depoſited in a number of handlers or duſters, (as they are called,) as occaſion requires, and the hides are thrown promiſcuouſly into it, where they muſt be drawn and returned much in the ſame manner as directed in the article of liming, and carried from a weaker to a ſtronger ooze as the leather ſhall require, till they are found to be ſufficiently filled. It will be found, that the finer particles of the bark will inſinuate themſelves into the pores of the leather, and lodge there; and at ſame time the aſtringent quality will ſtrengthen and brace the fibres, and bring them again to their proper tone, after their relaxed ſtate in the bait, which will make the leather appear to ſwell, and feel plump and ſoft. Here again no rule can direct an unexperienced perſon to know when a hide is properly oozed; and indeed ſome kinds of leather require a greater and ſome a leſſer degree of it, according to the purpoſe for which it is intended; but in general, there is leſs danger in oozing plentifully than in being ſparing of it, as it always adds to the weight and beauty of the leather. A middling hide may be oozed in three weeks, and ſooner or later in proportion to the ſtrength of the ooze, the number of draughts, and heat of the weather.

Of Lopping, *or what is more properly called* Tanning.

This part of the operation is deſigned to preſerve the fibres from corruption, and at the ſame time to conſolidate the whole into one compact body; or, in ſome ſenſe, it may be called *lignifying* the hide, (if the term may be allowed.) This muſt evidently be the work of time, as the nature of the fibres muſt be in a great meaſure changed, and the new-imbibed matter incorporated and conſolidated with them. In order to perform this, the hides are ſpread out at their full breadth and length in a vat, and a ſtratum of beat bark thrown betwixt each of them. This vat holds at firſt as much liquor as will juſt cover the hides; and in this ſituation they are allowed to lie till the ſtrength of the bark is thought to be exhauſted, which is commonly from four to ſix weeks; and the operation is repeated till the hides are ſufficiently tanned, and which is generally from two to four times, according to the ſtrength of the leather. The bark ſhould be rounder beat, and more given to the lop, for large hides than ſmall ones; and conſequently larger leather ſhould lie longer in the lop.

Of Currying.

The leather, when only tanned, is not ſufficiently ſoft and pliable to anſwer a number of purpoſes. The currier's province is to reduce the leather to the proper thickneſs, pliableneſs, and colour, requiſite for the different uſes to which it is applied: and though there is a material difference in the method of manufacturing the ſeveral kinds, and a good deal of dexterity required; yet what could be here ſaid of them would be of little uſe to thoſe who are unacquainted with the buſineſs. We ſhall therefore reduce all we are to ſay on this ſubject to a general detail of the proceſs.

The leather, after it has driped ſome time from the tan-pit, is ſhaven on an upright beam with a knife whoſe edge is turned on the one ſide, and with which the currier can take down the leather in the ſame manner as a wright can take a ſhaving from a piece of wood with his plane. After the currier has thus levelled the hide or ſkin to his purpoſe, (which is always done on the fleſh-ſide,) he ſpreads it out on a ſtone or table made for the purpoſe, and there ſcours it on the grain-ſide from all the looſe tan, and other ſtuff that may hurt the beauty of the grain. He then puts on a certain quantity of oil on both grain and fleſh ſide, for the purpoſe of ſoftening the fibres, and at the ſame time making them tough, and hangs it up to dry. When it is ſufficiently dry, there is a thin ſhaving again taken off the fleſh-ſide, in order to clean or brighten it up; and then it is rubbed backward and forward upon a table by the currier with a nicked or furrowed board, keeping the leather always doubled at the place where he rubs, till it be made ſoft and pliable to his intention. This laſt part of the operation is properly called *Currying*, and it is from this that the buſineſs gets its name. As to the colour, the leather is fair or dark in proportion to the quantity of oil laid on, if the tanning has been properly performed, and the currier do not neglect ſome material part of his duty. Curriers ſeldom dye any colour but black, which is done with copperas and a very little logwood.

TANTALUS's

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TANTALUS's CUP. See HYDROSTATICS, p. 808.

TANZY, in botany. See TANACETUM.

TAPE-WORM. See TÆNIA.

TAPESTRY, a curious kind of manufacture, ſerving to adorn a chamber or other apartment, by covering or lining the walls thereof. It is a kind of woven hangings of wool and ſilk, frequently raiſed and enriched with gold and ſilver, repreſenting figures of men, animals, landſkips, hiſtories, *&c.*

TAPPING, in general, the act of piercing an hole in a veſſel, and applying a tube or canula in the aperture, for the commodious drawing off the liquors contained therein.

TAPPING, in ſurgery. See SURGERY, p. 655.

TAR, a thick, black, unctuous ſubſtance, obtained from old pines and fir-trees, by burning them with a cloſe ſmothering heat: much uſed in coating and caulking ſhips, *&c.* See the article PITCH.

Water impregnated with the more ſoluble parts of tar, proves, in conſequence of this hot pungent oil, warm and ſtimulating: it ſenſibly raiſes the pulſe, and quickens the circulation. By theſe qualities, in cold, languid, phlegmatic habits, it ſtrengthens the ſolids, attenuates viſcid juices, opens obſtructions of the minuter veſſels, and promotes perſpiration and the fluid ſecretions in general; whilſt in hot bilious temperaments, it diſpoſes to inflammation, and aggravates the complaints which it has been employed to remove.

TARACON, a city of Spain, in the province of Arragon, ſituated on the confines of Old Caſtile: W. long. 2° 6′, and N. lat. 41° 55′.

TARAGON, a city and port-town of Spain, in the province of Catalonia, ſituated on the Mediterranean ſea: in E. long. 1° 15′, and N. lat. 41° 6′.

TARANTO, a port-town of Italy, in the kingdom of Naples, ſituated on the gulph of Otranto, forty-five miles weſt of that city, being the ſee of an archbiſhop.

TARANTULA, in zoology. See ARANEA.

TARE, is an allowance for the outſide package, that contains ſuch goods as cannot be unpacked without detriment; or for the papers, threads, bands, *&c.* that incloſe or bind any goods imported looſe; or, though imported in caſks, cheſts, *&c.* yet cannot be unpacked and weighed nett.

TARENTAIS DUCHY, the ſouth diviſion of Savoy, having Piedmont on the ſouth-eaſt, and Savoy Proper on the north-weſt: ſubject to the king of Sardinia.

TARGET, a kind of ſhield or weapon of defence made uſe of by the ancients.

TARGUM, a name whereby the Jews call the Chaldee paraphraſes, or expoſitions of the Old Teſtament in the Chaldee language. See BIBLE.

TARIF, a table or catalogue, containing the names of different ſorts of merchandize, with the duties to be paid, as ſettled by authority, amongſt trading nations.

TARPEIAN, in Roman antiquity, an appellation given to a ſteep rock in Rome: whence, by the law of the twelve tables, thoſe guilty of certain crimes were precipitated.

TARSUS, in anatomy. See ANATOMY, p. 185.

TARSUS, now Teraſſo, once the capital of Cilicia, in the Leſſer Aſia, now a province of Aſiatic Turky, is ſituated on the north ſide of the Levant ſea: E. long. 35°, N. lat. 37°.

TARTAR. See CHEMISTRY, p. 98, 65.

TARTARY, a vaſt country in the northern parts of Aſia, bounded by Siberia on the north and weſt: this is called Great-Tartary. The Tartars who lie ſouth of Moſcovy and Siberia, are thoſe of Aſtracan, Circaſſia, and Dagiſtan, ſituated north-weſt of the Caſpian ſea; the Calmuc Tartars, who lie between Siberia and the Caſpian-ſea; the Uſbec Tartars and Moguls, who lie north of Perſia and India; and, laſtly, thoſe of Tibet, who lie north-weſt of China.

TASSEL, a ſort of pendant ornament at the corners of a cuſhion, or the like.

In building, taſſels denote thoſe pieces of board that lie under the ends of the mantlet-rees.

TASTE, in phyſiology, a peculiar ſenſation excited by means of the organs of taſte, *viz.* the papillæ on the tongue. See ANATOMY, p 304.

Intellectual TASTE. The external ſenſe, with which nature has furniſhed us, and by which we diſtinguiſh and reliſh the various kinds of nouriſhment that are adapted to health and pleaſure, has in all languages given occaſion to the metaphorical word *taſte*, by which we expreſs our perception of beauty, deformity, or defect, in the ſeveral arts. *Taſte* then, in general, is a quick diſcernment, a ſudden perception, which, like the ſenſation of the palate, anticipates reflection; like the palate, it reliſhes what is good with an exquiſite and voluptuous ſenſibility, and rejects the contrary with loathing and diſguſt; like the palate alſo, it is often doubtful, and, as it were, bewildered, not knowing whether it ſhould reliſh or reject certain objects, and frequently requires the influence of habit to give it a fixed and uniform determination.

To have a taſte, ſuppoſes ſomething more than merely to perceive, and to diſcern with accuracy the beauty of any work or object. This beauty muſt be *felt*, as well as *perceived*; the mind muſt be touched and affected by it in a lively and ſenſible manner. This feeling however, in order to conſtitute true *taſte*, muſt not be a vague and confuſed ſenſation; but muſt be attended with a diſtinct view, a quick and comprehenſive diſcernment of the various qualities, in their ſeveral relations and connections, which enter into the compoſition of the object we contemplate. And in this we ſee another ſtriking reſemblance between the intellectual taſte and the ſenſual one: for as a nice palate perceives immediately the mixture of different wines, ſo the man of taſte will quickly diſcern the motley mixture of different ſtyles in the ſame production; and, let the beauties and defects be ever ſo cloſely blended in an object, will always be capable of diſtinguiſhing the former from the latter.

As the corruption of the *ſenſual taſte* diſcovers itſelf by a reliſh for only thoſe delicate and high-ſeaſoned diſhes, in which all the refinements of art have been employed to excite a forced ſenſation of pleaſure; ſo the depravity of the *intellectual taſte* manifeſts itſelf by an attachment to far-fetched and ſtudied ornaments, and by a want of reliſh for thoſe beauties which are unaffected and natural. The corruption of the ſenſual taſte, which makes us delight in ſuch aliments as are diſguſting to thoſe whoſe organs are in a good ſtate, is in reality a kind of diſeaſe; nor is that depravity of the intellectual taſte which makes many prefer the *burleſque* to the *ſublime*, and the laboured ſtiffneſs of art to the beautiful ſimplicity of nature, leſs a diſeaſe in our mental frame.

The intellectual *taſte* is much more formed by education and culture, than the ſenſual one; for though the

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latter may be brought, by habit, to reliſh what at firſt excited loathing and diſguſt; yet it does not ſeem to have been the intention of nature, that the generality of mankind ſhould acquire by cuſtom and experience thoſe ſenſations and perceptions which are neceſſary to their preſervation. It is otherwiſe with the *intellectual taſte*: its formation requires time, inſtruction, and experience. A young man uninſtructed in the arts of muſick and painting, let his natural ſenſibility be ever ſo quick and lively, will not immediately diſtinguiſh, in a grand concert of muſick, the various parts whoſe connection and relation conſtitute the eſſence and charm of the compoſition; nor will he perceive in a picture the gradations of light and ſhade, that harmony of colours, that correctneſs of deſign, which characteriſe a finiſhed piece; but in proceſs of time, and alſo by degrees, he learns both to hear and to ſee in a more perfect manner. The ſame uninſtructed perſon will find a variety of emotions ariſe in his mind the firſt time he is preſent at the repreſentation of a fine tragedy: but he will neither perceive the dexterity of the author in maintaining the unities; nor that exquiſite art by which the drama is ſo managed, that no perſon enters upon the ſcene nor quits it without an evident reaſon; nor yet that ſtill more nice and difficult art of making the various ſubordinate intereſts terminate and centre in one, which abſorbs them all. It is only by the force of habit and reflection, that he will diſtinguiſh theſe ſeveral objects of *taſte*, and feel delightful ſenſations from circumſtances of which formerly he had little or no idea.

Elegant and able artiſts may communicate their feelings and their diſcernment to others, and thus excite *taſte* in a nation, which, without them, had never known its refined pleaſures. By frequently contemplating the works of great and eminent maſters in the various arts, the powers of nature ariſe into taſte; and we imbibe, as it were, the ſpirit of theſe illuſtrious men, ſo as to come at length to look at a gallery of paintings with the eyes of a Le Brun, a Pouſſin, or a Le Sueur; nay, we even read works of learning and genius with a portion of that ſpirit that appears in their compoſition.

If, in the firſt periods of the culture of the arts and ſciences, it has ſometimes happened, that a whole nation have been unanimous in the praiſe of authors full of defects, and whom ſucceeding ages have beheld with indifference, and even with contempt; the reaſon is, that theſe authors had natural beauties which were perceived by all, while that juſt diſcernment that was neceſſary to diſtinguiſh their numerous defects, and which is leſs the gift of nature, than the reſult of time, habit, and reflection, was as yet acquired by none. Thus Lucilius, who had been in the higheſt reputation among the Romans, ſunk into oblivion when Horace aroſe; and Regnier was univerſally admired by the French, until Boileau appeared; and if there are ſeveral ancient authors, who have maintained their credit, notwithſtanding the abſurdities that are to be found in every page of their writings, it muſt be the authors of thoſe nations, among whom no judicious and correct writer has appeared to open their eyes, like Horace among the Romans, and Boileau among the French.

It is a common ſaying, that there is no diſputing about taſtes: and if by the *taſte* here be underſtood the palate, which loaths certain aliments and reliſhes others, the maxim is juſt; becauſe it is needleſs to diſpute about what cannot be corrected, or to attempt reforming the conſtitution and mechaniſm of organs merely corporeal. But the maxim is falſe and pernicious, when applied to that *intellectual taſte* which has for its objects the arts and ſciences. As theſe objects have real charms, ſo there is in reality a good taſte which perceives them, and a bad one which perceives them not; and there are certain methods by which we may often correct thoſe mental defects which produce a depraved *taſte*. But it muſt be granted, at the ſame time, that there are certain phlegmatick ſpirits, which nothing can enflame; and alſo certain diſtorted intellects, which it is impoſſible to rectify: with ſuch therefore, it is in vain to diſpute about taſtes, becauſe they have none at all.

In many things taſte ſeems to be of an arbitrary nature, and without any fixed or uniform direction, ſuch as in the choice of dreſs and equipage, and in every thing that does not come within the circle of the finer arts. In this low ſphere it ſhould be diſtinguiſhed by the name of *fancy*; for it is *fancy*, rather than *taſte*, that produces ſuch an endleſs variety of new and contradictory modes.

The taſte of a nation may degenerate and become extremely depraved; and it almoſt always happens, that the period of its perfection is the forerunner of its decline. Artiſts, through the apprehenſion of being regarded as mere imitators, ſtrike out into new and uncommon paths, and turn aſide from the beautiful ſimplicity of nature, which their predeceſſors invariably kept in view. In theſe efforts there is a certain degree of merit, which ariſes from induſtry and emulation, and caſts a veil over the defects which accompany their productions. The public, fond of novelty, applauds their invention; but this applauſe is ſoon ſucceeded by ſatiety and diſguſt. A new ſet of artiſts ſtart up, invent new methods to pleaſe a capricious taſte, and depart ſtill further from nature than thoſe who firſt ventured from its paths into the wilds of fancy. Thus the taſte of a people degenerates into the groſſeſt corruption. Overwhelmed with new inventions, which ſucceed and efface each other with incredible rapidity, they ſcarcely know where they are, and caſt back their eager and anxious deſires towards the period when *true taſte* reigned under the empire of nature. But they implore its return in vain; that happy period cannot be recalled; it depoſits, however, in the cuſtody of certain choice ſpirits, the ſublime pleaſures of *true taſte*, which they cheriſh and enjoy in their little circle, remote from the profane eye of the depraved and capricious multitude.

There are vaſt countries, where *taſte* has not yet been able to penetrate. Such are thoſe uncultivated waſtes, where civil ſociety has never been brought to any degree of perfection, where there is little intercourſe between the ſexes, and where all repreſentations of living creatures in painting and ſculpture are ſeverely prohibited by the laws of religion. Nothing renders the mind ſo narrow, and ſo little, if we may uſe that expreſſion, as the want of ſocial intercourſe; this confines its faculties, blunts the edge of genius, damps every noble paſſion, and leaves in a ſtate of langour and inactivity every principle that could contribute to the formation of *true taſte*. Beſides, where ſeveral of the finer arts are wanting, the reſt muſt neceſſarily languiſh and decay, ſince they are inſeparably connected together, and mutually ſupport each other. This is one reaſon, why the Aſiatics have never excelled in any of the arts; and hence alſo it is that *true taſte* has been confined to certain countries in Europe.

TATA,

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TATA, or SINDA, the capital of a province of the ſame name in the Hither India, in Aſia, ſituated at the mouth of the Indus: E. long. 68°, N. 25° 40′.

TAT-TOO, a beat of a drum at night, to advertiſe the ſoldiers to retreat or repair to their quarters in their garriſon, or to their tents in a camp.

TAU, or TAW, in heraldry, an ordinary in figure of a T, ſuppoſed to repreſent St. Andrew's croſs, or a croſs potence, the top part cut off. See CROSS.

TAVASTUS, the capital of the province of Tavaſtia, in the territory of Finland in Sweden, ſituated eighty-four miles north-eaſt of Abo: E. long. 24°, N. lat. 61° 20′.

TAUGHT, or TAU'T, in the ſea-language, ſignifies the ſame as ſtiff, or faſt: thus, to ſet taught the ſhrouds or ſtays, is to make them more tight and ſtiff.

TAVISTOCK, a borough of Devonſhire, thirty-two miles weſt of Exeter.

It ſends two members to parliament, and gives the title of marquis to the noble family of Ruſſels dukes of Bedford.

TAUNTON, a borough of Somerſetſhire, twenty miles miles ſouth-weſt of Wells. It ſends two members to parliament.

TAURIS, or TABRIS, a city of Perſia, four hundred miles north of Iſpahan: E. long. 46° 30′, N. lat. 38° 20′.

TAURUS, the BULL, in zoology, See BOS.

TAURUS, in aſtronomy. See ASTRONOMY, p. 847.

TAUTOLOGY, a needleſs repetition of the ſame thing in different words.

TAWING, the art of dreſſing ſkins in white, ſo as to be fit for divers manufactures, particularly gloves, &c.

All ſkins may be tawed; but thoſe chiefly uſed for this purpoſe are lamb, ſheep, kid, and goat ſkins.

The method of tawing is this: Having cleared the ſkins of wool or hair, by means of lime, they are laid in a large vat of wood or ſtone, ſet on the ground full of water, in which quick-lime has been ſlaked; wherein they are allowed to lie a month or ſix weeks, according as the weather is more or leſs hot, or as the ſkins are required to be more or leſs ſoft and pliant.

While they are in the vat, the water and lime is changed twice, and the ſkins are taken out and put in again every day; and when they are taken out for the laſt time, they are laid all night to ſoak in a running water, to get out the greateſt part of the lime; and in the morning are laid together by fixes one upon another, upon the wooden leg (and are ſcraped ſtoutly one after another, to get the fleſh off from the fleſhy ſide, with a cutting two-handled inſtrument called a knife; and then they cut off the legs, (if they are not cut off before) and other ſuperfluous parts about the extremes. Then they are laid in a vat or pit with a little water, where they are fulled with wooden peſtles, for the ſpace of a quarter of an hour; and then the vat is filled up with water, and they are rinſed in it.

In the next place, they are thrown on a clean pavement to drain, and afterwards caſt into a freſh pit of water, out of which they rinſe them well, and are laid again on the wooden leg, ſix at a time, with the hair-ſide outermoſt; over which they rub a kind of whetſtone very briſkly, to ſoften and fit them to receive four or five more preparations, given them on the leg, both on the fleſh-ſide and the hair-ſide, with the knife, after the manner above mentioned.

After this they are put into a pit of water and wheaten-bran, and ſtirred about in it with wooden poles, till the bran is perceived to ſtick to them, and then they are left: as they riſe of themſelves to the top of the water by a kind of fermentation, they are plunged down again to the bottom; and at the ſame time fire is ſet to the liquor, which takes as eaſily as if it were brandy, but goes out the moment the ſkins are all covered.

They repeat this operation as often as the ſkins riſe above the water; and when they have done riſing they take them out, lay them on the wooden leg, the fleſhy ſide outwards, and paſs the knife over them to ſcrape off the bran.

Having thus cleared them of the bran, they lay the ſkins in a large baſket, and load them with huge ſtones to promote their draining: and when they have drained ſufficiently, they give them their feeding, which is performed after the manner following:

For one hundred of large ſheep-ſhins, and for ſmaller in proportion, they take eight pounds of alum, and three of ſea-ſalt, and melt the whole with water in a veſſel over the fire, pouring the diſſolution out, while yet lukewarm, into a kind of trough, in which is twenty pounds of the fineſt wheat flower, with the yolks of eight dozen of eggs; of all which is formed a kind of paſte, a little thicker than children's pap; which, when done, is put into another veſſel, to be uſed in the following manner.

They pour a quantity of hot water into the trough in which the paſte was prepared, mixing two ſpoonfuls of the paſte with it; to do which they uſe a wooden ſpoon, which contains juſt as much as is required for a dozen of ſkins: and when the whole is well diluted, two dozen of the ſkins are plunged into it; but they take care that the water be not too hot, which would ſpoil the paſte and burn the ſkins.

After they have lain ſome time in the trough, they take them out, one after another, with the hand, and ſtretch them out; this they do twice; and after they have given them all their paſte, they put them into tubs, and there full them afreſh with wooden peſtles.

Then they put them into a vat, where they are ſuffered to lie for five or ſix days, or more; then they take them out in fair weather, and hang them out to dry on cords or racks: and the quicker they are dried the better; for if they be too long a-drying, the ſalt and alum within them are apt to make them riſe in a grain, which is an eſſential fault in this kind of dreſſing.

When the ſkins are dry, they are made up into bundles, and juſt dipt in fair water, and taken out and drained; and being thrown into an empty tub, and after having lain ſome time are taken out and trampled under foot.

Then they draw them over a flat iron-inſtrument, the top of which is round like a battledore, and the bottom fixed into a wooden block, to ſtretch and open them; and having been opened, they are hung in the air upon cords to dry; and being dry, they are opened a ſecond time, by paſſing them again over the ſame inſtrument.

In the laſt place they are laid on a table, pulled out, and laid ſmooth, and are then fit for ſale.

TAX, a tribute rated upon every town, which formerly was

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was wont to be paid annually into the King's-exchequer, but now not without conſent of parliament; it differs from a ſubſidy in this, that it is always certain, as ſet down in the exchequer-book, and in general levied of every town, and not particularly of every man, *&c.* The ancient way of levying taxes was by tenths and fifteenths, afterwards by ſubſidies and royal aids, and at length by a pound rate; the former of theſe were all upon the perſon and perſonal eſtate, but the laſt upon lands and rents.

TAXUS, in botany, a genus of the diœcia monodelphia claſs. The calix of both male and female conſiſts of three leaves; neither of them have any corolla; the ſtamina are numerous; the antheræ are rotated, and divided into eight ſegments; the female has no ſtylus; and the berry contains one ſeed. There are two ſpecies, only one of them, *viz.* the baccata, or yew-tree, a native of Britain.

TAY, a river of Scotland, riſing from the loch or lake of Tay, in Braidalbin, and running eaſt through Athol: it afterwards turns ſouth-eaſt, and dividing the counties of Perth and Angus from Strathern and Fife, falls into the frith of Tay.

TAYVEN, a city of China, in Aſia, in the province of Xanſi, two hundred and forty miles ſouth-weſt of Pekin: E. long. 108°, N. lat. 38° 30′.

TEA, or THEA, in botany, a genus of the polyandria monogynia claſs of plants. The corolla conſiſts of nine petals, and the calix of five leaves; and the berry is tricoccous. There are two ſpecies, both natives of China.

This ſhrub grows to five or ſix feet high, and is very ramoſe: the leaves are about an inch long, near half an inch broad, ſerrated, and terminating in a point. The traders in tea diſtinguiſh a vaſt many kinds of it, as they differ in colour, flavour, and the ſize of the leaf. To enumerate the ſeveral ſubdiſtinctions were endleſs; the general diviſion is into three kinds, the ordinary green-tea, the finer green, and the bohea; to one or other of which all the other kinds may be referred. The common green tea has ſomewhat ſmall and crumpled leaves, much convoluted, and cloſely folded together in the drying. Its colour is a duſky-green, its taſte ſub-aſtringent, and its ſmell agreeable. It gives the water a ſtrong yellowiſh green colour. The fine green has larger leaves, leſs rumpled and convoluted in the drying, and more lax in their folds; it is of a paler colour, approaching to the blue-green, of an extremely pleaſant ſmell, and has a more aſtringent, yet more agreeable taſte than the former. It gives a pale-green colour to water. To this kind are to be referred all the higher priced green teas, the hyſon, imperial, *&c.* The bohea conſiſts of much ſmaller leaves than either of the other, and thoſe more crumpled and cloſely folded than in either. It is of a darker colour than the other, often blackiſh; and is of the ſmell and taſte of the others, but with a mixed ſweetneſs and aſtringency. The green teas have all ſomewhat of the violet-flavour; the bohea has naturally ſomewhat of the roſe-ſmell. The leaves when gathered are dried with great caution, partly by the help of heat, partly by the air, and when thoroughly prepared will keep a long time freſh and good. Every parcel, when dried, though gathered promiſcuouſly, is ſeparated, according to the largeneſs and ſmallneſs of the leaves, into three or four different kinds, each of which is of a different price, and has its different name. The bohea tea is gathered before the leaves are perfectly opened, and is made to undergo a greater degree of heat in the curing, to which its colour and peculiar flavour is in a great meaſure owing.

Tea, moderately and properly taken, acts as a gentle aſtringent and corroborative.

TEAL, in ornithology. See ANAS.

TEARS, a lymph or aqueous humour, which is ſubtile, limpid, and a little ſaltiſh: it is ſeparated from the arterial blood by the lachrymal glands, and ſmall glandulous grains on the inſide of the eye-lids. See ANATOMY, p. 294.

TEBETH, the tenth month of the Jewiſh eccleſiaſtical year, and fourth of the civil. It anſwers to our month of December.

TECKLENBURG, a city of Germany, in the circle of Weſtphalia, capital of a county of the ſame name, thirteen miles ſouth-weſt of Oſnabrug, ſubject to its own count: E. long. 7° 20′, N. lat. 52° 21′.

TECHNICAL, expreſſes ſomewhat relating to arts or ſciences: in this ſenſe, we ſay technical terms.

TE DEUM, the name of a celebrated hymn, uſed in the Chriſtian church, and ſo called becauſe it begins with theſe words, *Te Deum laudamus*; "We praiſe thee, O God." It is ſung in the Romiſh church, with great pomp and ſolemnity, upon the gaining of a victory, or other happy event.

TEES, a river which riſes on the confines of Cumberland; and running eaſtward divides the county of Durham from Yorkſhire, and falls into the German ſea below Stockton.

TEFLIS, the capital of Perſian Georgia in Aſia, ſituated on the river Kur, or Cyrus, three hundred miles north of Tauris, and as many ſouth of Aſtracan: E. long. 47° 20′, N. lat. 43°.

TEGAPATAN, a port-town of the hither India, in Aſia, near Cape Comorin, eighty miles ſouth of Cochin, and a hundred and ſixty north-weſt of Columbo in Ceylon: E. long. 76°, N. lat. 8°.

TEGUMENT, any thing that ſurrounds or covers another.

TEHAMA, one of the diviſions of Arabia Felix in Aſia, ſituated on the Red-ſea, between the provinces of Mecca and Hadramut.

TEINTS and SEMI-TEINTS, in painting, denotes the ſeveral colours uſed in a picture, conſidered as more or leſs high, bright, deep, thin, or weakened, and diminiſhed, *&c.* to give the proper relievo, ſoftneſs, or diſtance, *&c.* of the ſeveral objects.

TEISSE, or TEYS, a river of Hungary, which riſes in the Carpathian mountains; and running from eaſt to weſt, paſſes from Tokay; then turning ſouth, paſſes by Zolnock and Segedin; and having joined the river Meriſh, falls into the Danube, oppoſite to Salankamen.

TELAMON, a name given to thoſe figures or half figures of men ſo commonly uſed, inſtead of columns or pilaſters, to ſupport any member in architecture, as a balcony, or the like.

TELEPHIUM, in botany, a genus of the pentandria trigynia claſs. The calix conſiſts of five leaves; and the corolla of five petals, inſerted into the receptacle; and the capſule has one cell and three valves. The ſpecies are two, none of them natives of Britain.

TELE-

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TELESCOPE. See OPTICS, p. 421.

TELESIN, a province of the kingdom of Algiers, in Africa, ſituated on the confines of the empire of Morocco.

TELLER, an officer of the exchequer, in ancient records called tallier. There are four of theſe officers, whoſe duty is to receive all ſums due to the king, and to give the clerk of the pells a bill to charge him therewith. They likewiſe pay all money due from the king, by warrant from the auditor of the receipt; and make weekly and yearly books, both of their receipts and payments, which they deliver to the lord treaſurer.

TELLICHERRY, a port-town on the Malabar coaſt, in the Hither India, thirty miles north of Callicut: E. lon. 75° N. lat. 12°.

TEMESWAER, the capital city of the Bannat of Temeſwaer, lately annexed to Hungary, ſixty miles north-eaſt of Belgrade: E. long. 22°, N. lat. 45° 55′.

TEMPERAMENT, among phyſicians, denotes the ſame with conſtitution; or a certain habitude of the humours of the human body, whereby it may be denominated hot, cold, moiſt, dry, bilious, ſanguine, phlegmatic, melancholic, *&c*

TEMPLARS, a religious order inſtituted at Jeruſalem, abouth the year 1118. Some religious gentlemen put themſelves under the government of the patriarch of Jeruſalem, renounced property, made the vow of celibacy and obedience, and lived like canons regular. King Baldwin aſſigned them an apartment in his palace. They had likewiſe lands given them by the king, the patriarch, and the nobility, for their maintenance. At firſt there were but nine of this order, and the two principal perſons were Hugo de Paganis, and Geoffrey of St Omers. About nine years after their inſtitution, a rule was drawn up for them, and a white habit aſſigned them, by pope Honorius II. About twenty years afterwards, in the popedom of Eugenius III. they had red croſſes ſewed upon their cloaks, as a mark of diſtinction; and in a ſhort time they were increaſed to about three hundred, in their convent at Jeruſalem. They took the name of Knights Templars, becauſe their firſt houſe ſtood near the temple dedicated to our Saviour at Jeruſalem. This order, after having performed many great exploits againſt the infidels, became rich and powerful all over Europe; but the knights, abuſing their wealth and credit, fell into great diſorders and irregularities. Many crimes and enormities being alledged againſt them, they were proſecuted in France, Italy, and Spain; and at laſt, the pope, by his bull of the 22d of May 1312, given in the council of Vienna, pronounced the extinction of the order of Templars, and united their eſtates to the order of St John of Jeruſalem.

TEMPLE, a general name for places of public worſhip, whether pagan, Chriſtian, or otherwiſe. But the word, in a reſtrained ſenſe, is uſed to denote the places, or edifices, in which the pagans offered ſacrifice to their falſe gods.

TEMPORAL, a term generally uſed for ſecular, as a diſtinction from eccleſiaſtical. Thus we ſay temporal lords, and ſpiritual or eccleſiaſtical lords.

TEMPORUM OSSA See ANATOMY, p. 155.

TENAILLE, in fortification. See FORTIFICATION, p. 619

TENANT, one that holds lands or tenements of ſome lord, or landlord, by rent, fealty, *&c*. See TACK.

TENBURY, a market-town of Worceſterſhire, fifteen miles north-weſt of Worceſter.

TENBY, a port-town of Pembrokeſhire, ſituated on Briſtol channel: W. long. 4° 45′, N. lat. 51°. 40′.

TENCH, in ichthyology. See CYPRINUS.

TENDER, a ſmall ſhip, in the ſervice of men of war. for carrying of men, proviſions, or any thing elſe that is neceſſary.

TENDONS, are white, firm, and tenacious parts, continuous to the muſcles, and uſually forming their extremities. See ANATOMY, Part II

TENEBRÆ, an office in the Romiſh church, performed on Wedneſday, Thurday, and Friday, in Paſſion-week, at which time neither flowers nor images are allowed to be ſet upon the altars, but they muſt be covered with purple.

TENEBRIO, a genus of inſects belonging to the order of coleoptera. The laſt joint of the antennæ is roundiſh; the breaſt is ſomewhat convex, and marginated; and the elytra are hard. There are 33 ſpecies, principally diſtinguiſhed by their colour.

TENEDOS, one of the ſmalleſt iſlands of the Archipelago, ſituated near the coaſt of leſſer Aſia, weſt of the ruins of Troy, E. long. 27°, N. lat. 39° 30′.

TENEMENT, properly ſignifies a houſe; but in a larger ſenſe it is taken for any houſe, land, rent, or other thing, which a perſon holds of another.

TENERIF, one of the largeſt of the Canary Iſlands, ſituated in the Atlantic Ocean: W. long. 17°. N. lat. 28. being about 130 miles in circumference. It is a fruitful iſland, abounding in corn, wine, and oil; though pretty much incumbered with mountains, of which the moſt remarkable is that called the Pico of Tenerif, being one of the higheſt mountains in the world, in the form of a ſugar-loaf, the white top whereof may be ſeen at ſea upwards of one hundred miles.

TENES, a province of the kingdom of Algiers, in Africa.

TENESMUS, in medicine, a name given, by medical writers, to a complaint which is a continual deſire of going to ſtool, but without any ſtool being ready to be voided. This is uſually attended with ſome tumour, ſometimes with a very conſiderable one, in the part. This is properly no primary diſeaſe, but merely a ſymptomatic one, and differs in degree according to the diſeaſe on which it is an attendant.

TENOR, or TENOUR, the purport or content of a writing or inſtrument in law, *&c*.

Action of proving the TENOR, in Scots law. See LAW, Tit. XXX. 22.

TENOR, in muſick, the firſt mean, or middle part, or that which is the ordinary pitch of the voice, when neither raiſed to a treble, nor lowered to a baſs.

TENSE, in grammar, an inflection of verbs, whereby they are made to ſignify, or diſtinguiſh the circumſtance of time, in what they affirm. See GRAMMAR.

TENT, in ſurgery, a roll of lint worked into the ſhape of a nail, with a broad flat head,

TENTER, a machine uſed in the cloth-manufacture, to ſtretch out the pieces of cloth, ſtuff, *&c*. or only to make them even, and ſet them ſquare.

It is uſually about four feet and a half high, and for length exceeds that of the longeſt piece of cloth. It conſiſts of ſeveral pieces of wood, placed like thoſe which form

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form the barriers of a manege; ſo that the lower croſs piece of wood may be raiſed or lowered, as is found requiſite, to be fixed at any height, by means of pins. Along the croſs-pieces, both the upper and under one are hooked nails, called tenter-hooks, driven in from ſpace to ſpace,

TENTHREDO, a genus of inſects belonging to the order of hymenoptera. The mouth is furniſhed with jaws, but has no proboſcis; the wings are plain and tumid; the ſting conſiſts of two ſerrated laminæ, and the ſcutellum of two grains placed at a diſtance. There are 55 ſpecies, principally diſtinguiſhed by their colour, and the figure of the antennæ.

TENURE, in law, ſignifies the manner whereby lands or tenements are held, or the ſervice that the tenant owes to his lord. It likewiſe denotes the eſtate in the land. In England, tenures were anciently divided into the following eſcuage; that is, land held by the ſervice of the ſhield, and thereby the tenant was, at his own expence, obliged to follow his lord into the wars. Knight's ſervice and chivalry; when lands were held of the king, or meſne-lord, to perform ſervice in war. Burgage tenure; land held of the lord of the burrow, at a certain tent. Villenage, otherwiſe termed baſe-tenure; whereby the tenant was bound to do all inferior ſervices, commanded by the lord. Grand ſerjeanty; lands held by honorary ſervices at the king's coronation. Petit ſerjeanty; lands held of the king, to contribute yearly ſome ſmall thing towards his wars. Frankalmoine; that tenure by which lands were held by eccleſiaſtics, in free and perpetual alms. Socage tenure; where lands are held by tenants, to plow their lord's lands, and perform every office of huſbandry, at their own expence. But all theſe ancient tenures and ſervices are in general taken away, and reduced into common and free ſocage. The uſual tenures at preſent are, fee ſimple; which is an abſolute tenure of lands to a man and his heirs for ever. Fee tail; a limited fee, to a perſon and the heirs of his body begotten. Curteſy tenure; where a man having married a woman ſeiſed in fee, &c. has iſſue born alive by her, in which caſe, after her death, the huſband is tenant by the curteſy of England. Tenure in dower; is where a widow holds, for her life, a third part of her huſband's land, whereof he was ſeiſed in fee at any time during the coverture. There is alſo a tenure for life, or years, when lands are held for thoſe terms on reſerved rents. Copyholy tenure, is a holding for lives, or in fee, at the will of the lord, according to the cuſtom of the manor. For the ſeveral kinds of tenure or holding in Scotland, ſee LAW, Tit. xi.

TEPID, a term uſed by writers on mineral waters, &c. to expreſs ſuch of them as have a leſs ſenſible cold than common water.

TERCE, in Scots law. See LAW, Tit. xvi 24.

TERCERA, one of the largeſt of the Azores or weſtern iſlands, ſituated in the Atlantic ocean: W. long. 28°, and N. lat. 39°.

TEREBINTHUS, in botany. See PISTACIA.

TERES, in anatomy. See ANATOMY, p. 195.

TERGOWISCO, the capital of Wallachia, in European Turky, eighty miles ſouth-eaſt of Hermanſtat in Tranſilvania: E. long. 26° 30′, N. lat. 45° 35′.

TERM, in general, ſignifies much the ſame with boundary or limit.

TERM, in law, is generally taken for a limitation of time or eſtate: as a leaſe for term of life, or years.

TERM, in grammar, denotes ſome word or expreſſion of a language.

TERM *in the arts*, or TERM *of art*, is a word which, beſides the literal and popular meaning which it has, or may have, in common language, bears a further and peculiar meaning in ſome art or ſcience.

TERMINALIA, in antiquity, feaſts celebrated by the Romans, in honour of the god Terminus.

TERMINATION, in grammar, the ending of a word, or laſt ſyllable thereof.

TERNATE, the moſt northerly of the Molucca or Cloveiſlands, in the poſſeſſion of the Dutch.

TERRA. See GEOGRAPHY, and ASTRONOMY.

TERRA FIRMA, in geography, is ſometimes uſed for a continent, in contradiſtinction to iſlands.

TERRA DEL FOGO, an iſland of South-America, from which it is ſeparated by the ſtreights of Magellan.

TERRÆ FILIUS, SON OF THE EARTH, a ſtudent of the univerſity of Oxford, formerly appointed, in public acts, to make jeſting and ſatyrical ſpeeches againſt the members thereof, to tax them with any growing corruptions, &c.

TERRACE, a walk or bank of earth, raiſed in a garden or court, to a due elevation, for a proſpect.

TERRAQUEOUS, in geography, an appellation given to our globe, becauſe conſiſting of land and water.

TERRELLA, an appellation given to a loadſtone, when turned into a ſpherical figure, and is placed ſo, that its poles and equator, &c. correſpond to the poles and equator of the world; as being a juſt repreſentation of the great magnetical globe which we inhabit.

TERRESTRIAL, ſomething partaking of the nature of earth, or belonging to the globe of the earth: thus we ſay, the terreſtrial globe, &c.

TERRIER, a book, or roll, wherein the ſeveral lands, either of a private perſon, or of a town, college, church, &c. are deſcribed. It ſhould contain the number of acres, and the ſite, boundaries, tenants names, &c. of each piece or parcel.

TERRIER is alſo uſed for a ſmall hound. See CANIS.

TERRITORY, in geography, denotes an extent or compaſs of land, within the bounds, or belonging to the juriſdiction, of any ſtate, city, or other ſubdiviſion of a country.

TERROUEN, a town of Artois, in the French Netherlands, ſituated on the river Lis, ſix miles ſouth of St Omers.

TERTIAN, in medicine. See MEDICINE, p. 61.

TERTIATE *a great gun*, in gunnery, is to examine the thickneſs of the metal at the muzzle, whereby to judge of the ſtrength of the piece, and whether it be ſufficiently fortified. This is uſually done with a pair of caliber-compaſſes; and if the piece be home bored, the diameter leſs by the height, divided by 2, is the thickneſs at any place.

TERVEL, a city of Arragon, in Spain, ſituated on the river Guadalavira, ſeventy-five miles ſouth of Sarragoſſa: W. long. 1° 20′, N. lat. 40° 35′.

TESSELATED PAVEMENTS, thoſe of rich Moſaic work, made

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made of curious ſquare marbles, bricks, or tiles, called teſſelæ. from their reſembling dice.

TESSIN, a river of Italy, which, taking its riſe in the Alps, runs through the country of the Griſons and the lake Maggior; and then, turning ſouth-eaſt through the Milaneſe, paſſes by Pavia, and falls into the Po, a little below that city.

TEST, a veſſel of the nature of the coppel, uſed for large quantities of metals at once.

TEST-LIQUOR, a liquor uſed by dealers in brandies, to prove whether they be genuine, or mixed with home-ſpirits. This liquor is nothing but a green or white vitriol, diſſolved in fair water; for a few drops of it being let fall into a glaſs of old French brandy, will turn the whole to a purple, or fine violet colour; and by the ſtrength or paleneſs of this colour, the dealers judge the brandy to be genuine or mixed, in different proportions, with home-ſpirits.

TEST-ACT, a ſtatute 25 Car. II. cap. 2. which requires all officers, both civil and military, to take the oaths and teſt, *viz.* the ſacrament, according to the rites and ceremonies of the church of England; for the neglect whereof, a perſon executing any office mentioned in that ſtatute, forfeits the ſum of 500l. recoverable by action of debt.

TESTACEOUS, in natural hiſtory, an epithet given to animals covered with a ſhell, as tortoiſes, oyſters, pearl-fiſh, *&c.*

TESTAMENT. See LAW, Tit. xxviii. 2.

TESTATOR, the perſon who makes his will and teſtament.

TESTES, in anatomy. See ANATOMY, p. 270.

TESTIMONY. See EVIDENCE.

TESTUDO, in zoology, a genus belonging to the order of amphibia reptilia. It has four legs and a tail, and the body is covered with a ſtrong ſhell. There are 15 ſpecies, principally diſtinguiſhed by peculiarities in their feet. The midas, or common turtle, is found at the Aſcenſion iſle, and many other ſouthern iſlands. The ſhell of this animal is ſo ſtrong, that ſeveral men may ſtand upon it without injury. It lays membranaceous eggs in round holes which it digs in the ſand. The turtle is ſaid to continue ſeveral weeks in the acts of copulation. It grows to a vaſt ſize, ſome having been found to weigh 480 pounds.

The Americans find ſo good account in catching turtle, that they have made themſelves very expert at it: they watch them from their neſts on ſhore, in moon-light nights; and, before they reach the ſea, turn them on their backs, and leave them till morning; when they are ſure to find them, ſince they are utterly unable to recover their former poſture: at other times they hunt them in boats, with a peculiar kind of ſpear, ſtriking them with it through the ſhell; and as there is a cord faſtened to the ſpear, they are taken much in the ſame manner as the whales.

TESTUDO, in antiquity, was particularly uſed among the poets, *&c.* for the ancient lyre; by reaſon it was originally made by its inventor Mercury, of the black or hollow ſhell of the teſtudo aquatica, or ſea-tortoiſe, which he accidentally found on the banks of the river Nile.

TESTUDO, in the military art of the ancients, was a kind of cover or ſcreen which the ſoldiers, *e. gr.* a whole company, made themſelves of their bucklers, by holding them up over their heads, and ſtanding cloſe to each other. This expedient ſerved to ſhelter them from darts, ſtones, *&c.* thrown upon them, eſpecially thoſe thrown from above, when they went to the aſſault.

TESTUDO was alſo a kind of large wooden tower, which moved on ſeveral wheels, and was covered with bullocks hides ſtead, ſerving to ſhelter the ſoldiers when they approached the walls to mine them, or to batter them with rams.

It was called teſtudo, from the ſtrength of its roof, which covered the workmen as the ſhell does the tortoiſe.

TETANUS, in medicine, a convulſive motion that makes any part rigid or inflexible.

TETHYS, a genus of inſects belonging to the order of vermes molluſca. The body is oblong, fleſhy, and without feet; the mouth conſiſts of a cylindrical proboſcis under the duplicature of a lip; and there are two foramina at the left ſide of the neck. The ſpecies are two, both inhabitants of the ocean.

TETICACO, a great lake of Peru, more than two hundred miles in circumference: the towns ſituated on this lake are eſteemed the moſt delightful in all South America.

TETRACERA, in botany, a genus of the polyandria tetragynia claſs. The calix conſiſts of ſix leaves; and there are four capſules. There is but one ſpecies, a native of America.

TETRACHORD, in the ancient muſick, a concord conſiſting of four degrees or intervals, and four terms or ſounds; called alſo by the ancients diateſſaron, and by us a fourth.

TETRADECARHOMBIS, in natural hiſtory, the name of a genus of foſſils, of the claſs of the ſelenitæ, expreſſing a rhomboidal body, conſiſting of fourteen planes.

The characters of this genus are, that the bodies of it are exactly of the ſame form with the common ſelenitæ; but that each of the end-planes is divided into two; and there are, by this means, eight of theſe planes, inſtead of four.

TETRADIAPASON, a muſical chord, otherwiſe called a quadruple diapaſon, or eighth.

TETRADYNAMIA, in botany. See BOTANY, p. 635.

TETRAEDRON, in geometry, one of the five regular or platonic bodies or ſolids, comprehended under four equilateral and equal triangles.

TETRAGON, in geometry, a general name for any four-ſided figure, as a ſquare, parallelogram, rhombus, or trapezium.

TETRAGONIA, in botany, a genus of the icoſandria pentagynia claſs. The calix conſiſts of four ſegments; it has no corolla; and the drupa has four ſides, and four cells. There are two ſpecies, both natives of Æthiopia.

TETRAGONOTHECA, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is paleaceous; it has no pappus; and the calix conſiſts of one leaf, divided into four plain ſegments. There is but one ſpecies, a native of Virginia.

TETRAGRAMMATON, a denomination given by the Greeks to the Hebrew name of God, Jehovah, becauſe conſiſting of four letters.

TETRANDRIA, in botany. See BOTANY, p. 635.

TETRAO, in ornithology, a genus of birds, of the order of gallinæ, diſtinguiſhed by having the part of the forehead near the eyes naked and papilloſe. There are 20 ſpecies, diſtinguiſhed principally by their colour, their having rough or naked feet, *&c.*

TETRA-

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TETRAPETALOUS, in botany, an epithet given to flowers that conſiſt of four ſingle petals or leaves.

TETRAPHARMACUM, ſignifies any remedy conſiſting of four ingredients

TETRAPTERA, a name given to inſects which have four wings.

TETRAPTOTE, in grammar, a name given to ſuch defective nouns as have only four caſes; ſuch are *vicis*, *pecudis*, *ſordis*, &c. as being deprived of the nominative and vocative ſingular.

TETRAPYRAMIDIA, in natural hiſtory, the name of a genus of ſpars, influenced in their ſhape by an admixture of particles of tin, and found in form of broad-bottomed pyramids of four ſides.

TETRARCH, a prince who holds and governs a fourth part of a kingdom. Such originally was the import of the title tetrarch; but it was afterwards applied to any petty king or ſovereign.

TETRASTYLE, in the ancient architecture, a building, and particularly a temple, with four columns in its front.

TETUAN, a town of the empire of Morocco, ſituated about eight miles from the bay of that name, juſt within the ſtraits of Gibraltar: W. long. 6° 35′, N. lat. 35° 40′.

TEUCRIUM, in botany, a genus of the didynamia gymnoſpermia claſs. The upper lip of the corolla is bipartite. There are 31 ſpecies, four of them natives of Britain, *viz.* the ſcordium, or water germander, the leaves of which are ſaid to be deobſtruent, diuretic, and ſudorific; the chamedrys, or germander, the leaves, tops, and ſeeds of which are ſaid to be ſudorific, diuretic, *&c.*; the chamæpitys, or ground pine, the leaves of which are recommended as aperient and vulnerary; and the ſcorodonia, or wood-ſage.

TEUTONIC, ſomething belonging to the Teutons, an ancient people of Germany, inhabiting chiefly along the coaſts of the German ocean: thus, the Teutonic language is the ancient language of Germany, which is ranked among the mother tongues. The Teutonic is now called the German or Dutch.

TEUTONIC ORDER, a military order of knights, eſtabliſhed towards the cloſe of the twelfth century, and thus called as conſiſting chiefly of Germans or Teutons. The origin, *&c.* of the Teutonic order, is ſaid to be this. The Chriſtians, under Guy of Luſignan, laying ſiege to Acre, or Acon, a city of Syria, on the borders of the Holy Land, ſome Germans of Bremen and Lubec, touched with compaſſion for the ſick and wounded of the army, who wanted common neceſſaries, ſet on foot a kind of hoſpital under a tent, which they made of a ſhip's ſail, and here betook themſelves to a charitable attendance on them. This ſtarted a thought of eſtabliſhing a third military order, in imitation of the templars and hoſpitalers. The deſign was approved of by the patriarch of Jeruſalem, the archbiſhops and biſhops of the neighbouring places, the king of Jeruſalem, the maſters of the temple and hoſpital, and the German lords and prelates then in the Holy Land; and pope Calixtus III. confirmed it by his bull, and the new order was called the order of the Teutonic knights of the houſe of St. Mary at Jeruſalem. The pope granted them all the privileges of the Templars and Hoſpitalers of St. John, excepting that they were to be ſubject to the patriarchs and other prelates, and that they ſhould pay tithe of what they poſſeſſed.

TEWKSBURY, a borough-town of Gloceſterſhire, ſituated on the river Severn, ten miles north of Gloceſter. It ſends two members to parliament.

TEXEL, an iſland of Holland, ſituated at the entrance of the Zuyder-ſea, parted from the continent of Holland by a narrow channel, through which moſt ſhips bound to Amſterdam paſs.

TEXT, a relative term, contradiſtinguiſhed to gloſs or commentary, and ſignifying an original diſcourſe excluſive of any note or interpretation.

TEXTURE, properly denotes the arrangement and coheſion of ſeveral ſlender bodies or threads interwoven or entangled among each other, as in the webs of ſpiders, or in cloths, ſtuffs, *&c.*

THALAMI *nervorum opticorum*. See ANATOMY, p. 286.

THALIA, in botany, a genus of the monandria monogynia claſs. The corolla conſiſts of five waved petals; and the drupa has a double-celled nucleus. There is but one ſpecies, a native of America.

THALICTRUM, in botany, a genus of the polyandria polygynia claſs. The corolla conſiſts of five petals; it has no corolla; and the ſeeds are naked. There are 14 ſpecies, three of them natives of Britain, *viz* the flavum, or meadow-rue; the minus, or leſſer meadow-rue; and the alpinum, or mountain meadow-rue.

THAMES, a great navigable river of England, compoſed chiefly of the river Iſis and Thame; of which the Iſis is much the largeſt, and runs the longeſt courſe, riſing on the confines of Gloceſterſhire. At Lechlade it becomes navigable, from whence it continues its courſe north-eaſt to oxford, where it receives the Charwell; from Oxford it runs ſouth-eaſt to Abington, and ſo to Dorcheſter, where it receives the Thame, and continues its courſe ſouth-eaſt to Windſor, and thence runs eaſt to London, and continues the ſame courſe to the ſea, receiving the river Medway near the mouth of it. The Thame is but a ſmall river, which riſing near Tring in Hertfordſhire, croſſes the county of Bucks, and falls into the Iſis at Dorcheſter.

THANE, or THAIN, a name of an ancient dignity among the Engliſh and Scots, or Anglo-Saxons. Skene makes thane to be a dignity equal to the ſon of an earl. Camden will have it, that thanes were only dignified by the offices they bore. There were two kinds or orders of thanes; the king's thanes, and the ordinary thanes. The firſt were thoſe who attended the king in his courts, and who held lands immediately of the king. The ordinary thanes, or the *thani minores*, were the lords of the manors, who had particular juriidiction within their limits, and over their own tenants; theſe changed their names for that of barons, and hence their courts are called courts-baron to this day.

THANET, a little iſland of eaſt Kent, formed by the branches of the Stour and the ſea.

THAPSIA, in botany, a genus of the pentandria digynia claſs. The fruit is oblong, and ſurrounded with a membrane. There are four ſpecies, none of them natives of Britain.

THAWING, the reſolution of ice into its former fluid ſtate, by the warmth of the air, *&c.* See FREEZING.

THEA, in botany. See TEA.

THEATINES, a religious order in the Romiſh church, ſo called

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called from their principal founder John Peter Caraffa, then biſhop of Theate, or Chiete, in the kingdom of Naples, and afterwards pope, under the name of Paul IV. The names of the other founders were Gaetan, Boniface, and Conſiglieri. Theſe four pious men, deſiring to reform the eccleſiaſtical ſtate, laid the foundation of an order of regular clerks at Rome, in the year 1524. Pope Clement VII. approved the inſtitute, and permitted the brethren to make the three religious vows, to elect a ſuperior every three years, and to draw up ſtatutes for the regulation of the order. They firſt endeavoured, by their example, to revive among the clergy the poverty of the apoſtles and firſt diſciples of our Saviour, and were the firſt who aſſumed the title of regular clerks.

THEATRE, a public edifice for the exhibiting of ſcenic ſpectacles, or ſhews, to the people; comprehending not only the eminence on which the actors appear, and the action paſſes, but alſo the whole area of the place common to the actors and ſpectators.

THEBAID, a celebrated heroic poem of Statius, the ſubject whereof is the civil war of Thebes, between the two brothers Eteocles and Polynices; or, Thebes taken by Theſeus.

THEBES, the name of an ancient city in upper Egypt, now in ruins; as alſo an ancient city of Achaia, now a province of European Turky.

THEFT. See LAW, Tit. xxxiii. 28.

THEISM. See DEISM.

THELEGONUM, in botany, a genus of the monœcia polyandria claſs. The calix both of male and female conſiſts of two ſegments; neither of them have any corolla; the ſtamina are 12; and the female has one ſtylus, and a coriaceous capſule, with one cell and one ſeed. There is but one ſpecies, a native of Italy.

THEME, denotes the ſubject of an exerciſe, for young ſtudents to write or compoſe on.

THENAR, in anatomy. See ANATOMY, p. 200.

THEOBROMA, the CHOCOLATE-NUT-TREE, in botany, a genus of the polyadelphia pentandria claſs. The corolla conſiſts of five petals; the nectarium is bell-ſhaped; and the fruit is a woody cortex, of an unequal ſurface, with five ridges. There are two ſpecies, both natives of America.

THEOCRACY, in matters of government, a ſtate governed by the immediate direction of God alone: ſuch was the ancient government of the Jews, before the time of Saul.

THEODOLITE, a mathematical inſtrument much uſed in ſurveying. See GEOMETRY, p. 701.

THEOGONY, that branch of the heathen theology, which taught the genealogy of their gods.

THEOLOGY. See RELIGION.

THEOPHRASTA, in botany, a genus of the pentandria monogynia claſs. The corolla is bell-ſhaped, with obtuſe ſegments; and the capſule has one round large cell, and one ſeed. There is but one ſpecies, a native of America.

THEOREM, a ſpeculative propoſition, demonſtrating the properties of any ſubject.

THEORETIC, ſomething relating to theory, or that terminates in ſpeculation. See THEORY.

THEORY, in general, denotes any doctrine which terminates in ſpeculation alone, without conſidering the practical uſes and application thereof.

THERAPEUTÆ, a term applied to thoſe who are wholly employed in the ſervice of religion. This general term has been applied to particular ſects of men, concerning whom there have been great diſputes among the learned.

THERAPEUTICS, that part of medicine which acquaints us with the rules that are to be obſerved, and the medicines to be employed in the cure of diſeaſes.

THERAPHIM, certain images, or ſuperſtitious figures, mentioned in ſcripture. Some Jewiſh writers tell us, the theraphim were effigies of human heads, placed in niches, and conſulted as oracles. Others ſay, they were taliſmans, or figures of metal, caſt and engraved under certain aſpects of the planets; to which they aſcribed extraordinary effects.

THERIACA ANDROMACHI, a compound medicine, made in the form of an electuary.

THERMÆ, artificial hot baths, much uſed by the Romans.

THERMOMETER, an inſtrument for meaſuring the increaſe and decreaſe of the heat and cold of the air, by means of the elaſtic and expanſive power of bodies of the fluid ſort. See PNEUMATICS, p. 486.

THESEA, in antiquity, feaſts celebrated by the Athenians, in honour of Theſeus, conſiſting of ſports and games, with mirth and banquets: ſuch as were poor, and unable to contribute to them, were entertained at the public expence.

THESIS, a general poſition which a perſon advances, and offers to maintain. In colleges it is frequent to have placards, containing a number of them, in theology, in medicine, in philoſophy, in law, &c.

THESIUM, in botany, a genus of the pentandria monogynia claſs. The calix conſiſts of one leaf, into which the ſtamina are inſerted; there is but one ſeed. The ſpecies are ſeven, only one of them, *viz.* the linophyllon, or baſtard toad-flax, a native of Britain.

THESSALY, now called Janna, a province of European Turkey, bounded by Macedonia, on the north; by the Archipelago, on the eaſt; by Achaia, or Livadia, on the ſouth; and by Epirus, on the weſt.

THETFORD, the county-town of Norfolk, ſituated twenty-five miles ſouth-weſt of Norwich. It ſends two members to parliament.

THEURGY, a name given to that part of magic called white magic, or the white art. Thoſe who have written of magic have divided it into three kinds: the firſt is theurgy, as operating by divine means: the ſecond, natural magic, performed by the powers of nature: and the third, necromancy, which they imagined proceeded from invoking dæmons.

THIBET, one of the moſt powerful of the Tartar kingdoms, having China on the eaſt, and India on the weſt.

THIGH, in anatomy. See ANATOMY, p. 182, 203.

THIMBLE, an inſtrument made of braſs, ſilver, iron, &c. put on the finger to thruſt a needle through any cloth, ſilk, &c. uſed by all ſeamſtreſſes, taylors, &c.

THINKING, a general name for any act or operation of the mind. See LOGICK, and METAPHYSICS.

THIRLAGE. See LAW, Tit. xvi. 12.

THIRSK, a borough-town in the north-riding of Yorkſhire,

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ſhire, ſituated on the river Swale, ſixteen miles north-weſt of York. It ſends two members to parliament.

THIRST, an uneaſy ſenſation, ariſing from a deficiency in the ſaliva to moiſten the inward parts of the mouth; hence ariſes a ſtrong deſire for drink: it is a ſymptom generally attending feveriſh diſorders.

THISTLE, in botany. See CARDUUS.

Order of the THISTLE, or *of St* ANDREW, a military order of knighthood in Scotland, the riſe and inſtitution whereof is variouſly related by different authors. Leſley, biſhop of Roſs, reports, that the night before the battle between Athelſtan king of Northumberland, and Hungus king of the Picts, a bright croſs, in form of that whereon St Andrew (the tutelar ſaint of Scotland) ſuffered martyrdom, appeared to Hungus; who having gained the victory, ever after bore the figure of that croſs on his banners. Others aſſert, that Achaius king of Scotland firſt inſtituted this order, after having made the famous league offenſive and defenſive with Charlemagne king of France. But although the thiſtle had been acknowledged as the ſymbol of the kingdom of Scotland from the reign of Achaius, yet ſome refer the beginning of this order to Charles VII. of France. Others place the foundation of it as low as the year 1500.

The chief and principal enſign is a gold collar compoſed of thiſtles and ſprigs of rue interlinked with amulets of gold, having pendent thereunto the image of St Andrew with his croſs, and the motto, NEMO ME IMPUNE LACESSET.

The ordinary or common enſign worn by the knights, is a ſtar of four ſilver points, and over them a green circle, bordered and lettered with gold, containing the ſaid motto, and in the centre is a thiſtle proper; all which is embroidered on their left breaſt, and worn with the collar, with a green ribband over the left ſhoulder, and brought under the right arm; pendent thereto is the image of St Andrew, with his croſs, in a purple robe, within an oval of gold enamelled vert, with the former motto: but ſometimes they wear, encircled in the ſame manner, a thiſtle crowned.

About the time of the reformation, this order was dropped, till James II. of England reſumed it, by creating eight knights: however, the revolution unſettled it again, and it lay neglected till queen Anne, in 1703, reſtored it to the primitive deſign, of twelve knights of St Andrew.

THLASPI, in botany, a genus of the tetradynamia ſiliculoſa claſs. The pod is emarginated, heart-ſhaped, containing many ſeeds. There are ten ſpecies, ſix of them natives of Britain, *viz.* the campeſtre, or mithridate; the arvenſe, or treacle-muſtard; the perfoliatum, or perfoliate treacle-muſtard; the ſurtum, or perennial mithridate muſtard; the montanum, or mountain mithridate-muſtard; and the burſa paſtoris, or ſhepherd's purſe.

THOMÆANS, THOMISTS, or *Chriſtians of St* THOMAS, a people of the Eaſt-Indies, who, according to the tradition, received the Goſpel from St Thomas. Upon the arrival of the Portugueſe at Calicut, in their firſt voyage to the Indies, they met with ancient Chriſtians, who pretended to be deſcended from thoſe converted by St Thomas. The Thomæans being informed of a new people arrived among them, who bore a particular veneration for the croſs, ſent embaſſadors to them, to make an alliance with them, and to ſollicit their aſſiſtance againſt the Gentile princes, by whom they were greatly oppreſſed. A mixture of opinions, with a total interruption of paſtors, ſometimes for ſeveral years together, occaſioned that horrible chaos their religion was in at the arrival of the Portugueſe; for a ſpecimen whereof we ſhall add their manner of celebrating the euchariſt: Over their altar was a kind of gallery; and while the prieſt was ſaying the beginning of the office below, a cake of flour of rice was frying in oil, or butter, above; when enough, the cake was let down in a baſket upon the altar, where the prieſt conſecrated it: as to the other ſpecies, for wine they uſed a kind of brandy or arrack, variouſly prepared in that country. Nor was their ordination much more regular; the archdeacon, who was ſometimes more reſpected than the biſhop himſelf, frequently ordained prieſts: their other abuſes were infinite. The Portugueſe, for theſe two laſt centuries, have laboured the reformation of this church, and have employed both the eccleſiaſtic and ſecular power therein: for this end they have called the Thomæan biſhops to the council at Goa, have inſtructed, charged them, *&c.* and even ſent them for inſtruction to Portugal and Rome; but finding that they were ſtill apt to relapſe at their return, and that no good was like to be done with them, they reſolved to exclude them once for all, and to appoint an European biſhop in their room. Theſe proceedings have rendered the Portugueſe infinitely odious to the Thomæans.

St THOMAS, a city of the hither India, on the coaſt of Coromandel, three miles ſouth of Fort St George; ſubject to the Portugueſe.

St THOMAS is alſo an iſland in the Atlantic ocean, ſituated under the equator, in 8° E. long.

St THOMAS is alſo a town of Guiana, in South America, ſituated on the river Oronoko; ſubject to Spain.

St. THOMAS'S DAY, a feſtival of the Chriſtian church, obſerved on Dec. 21. in commemoration of St Thomas the apoſtle.

St THOMAS *of Canterbury's day*, a feſtival of the Romiſh church, obſerved on Dec. 29. in memory of Thomas Becket archbiſhop of Canterbury, who was murdered, or, as the Romaniſts ſay, martyred, in the reign of king Henry II.

THOMISM, the doctrine of St Thomas Aquinas, and his followers the Thomiſts, chiefly with regard to predeſtination and grace. There is ſome doubt what the true genuine thomiſm is, but there are authors who diſtinguiſh the thomiſm of St Thomas from that of the dominicans. Others again make thomiſm no other than a kind of janſeniſm diſguiſed: but janſeniſm, it is known, has been condemned by the popes, which pure thomiſm never was: in effect, the writings of Alvarez and Lemos, who were appointed by their order to lay down and defend, before the holy ſee, the dogmata of their ſchool, have ſince been reputed the rule of pure thomiſm.

THOMISTS, a ſect of ſchool-divines, who maintain thomiſm. See the preceding article.

THORACIC DUCT. See ANATOMY, p. 282.

THORAX, in anatomy. See ANATOMY, p. 277.

THORN, a city of Poland, in the province of regal Pruſſia, ſituated on the river Viſtula: E. long. 19°, and N. lat. 52° 40′.

THORN-

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THORNBACK, in ichthyology. See RAIA.

THORNBURY, a market-town of Gloceſterſhire, ſituated twenty miles ſouth-weſt of Gloceſter.

THORNEY-ISLAND, an iſland made by the branches of the Thames formerly, where Weſtminſter-abbey now ſtands.

THORNEY-ISLAND is alſo an iſland ſituated in a bay of the Eaſt channel, between Chicheſter and Portſmouth.

THOUGHT, a general name for all the ideas conſequent on the operations of the mind, and even for the operations themſelves.

THOULON, or TOULON, a port-town of Provence, in France, ſituated on a bay of the Mediterranean ſea: E. E. long. 6°, and N. lat. 43° 5′.

THOULOSE, or TOULOSE, a city of France, capital of the city of Languedoc, ſituated on the river Garonne: E. long. 1° 5′, and N. lat. 43° 40′.

THRACE, a province of European Turky, ſituated on the north ſide of the Propontis.

THRASHING, or THRESHING, in agriculture, the art of beating the corn out of the ears.

There are two ways of ſeparating corn from the ear; the firſt by beating it with a flail, which is properly what is called thraſhing. The other method, ſtill practiſed in ſeveral countries, is to make mules, or horſes, trample on it, backwards and forwards; this is properly what the ancients called tritura and trituratio. The Hebrews uſed oxen therein, and ſometimes yoked four together for this purpoſe. Another way among the ancients was with a kind of ſledge, made of boards joined together, and loaden with ſtones or iron, upon which a man was mounted, and the whole drawn over the corn by horſes: this inſtrument was called traha, or tribula.

THRAVE *of corn*, twenty-four ſheaves, or four ſhocks of ſix ſheaves to the ſhock; though, in ſome countries, they only reckon twelve ſhocks to the thrave.

THRICHECHUS, in zoology, a genus of quadrupeds belonging to the order of bruta. There are no fore-teeth in either jaw; the dog-teeth in the upper jaw are ſolitary; the lips are doubled; and in place of the two hind legs, they have a broad fleſhy tail or fin. There are two ſpecies, *viz.* 1. The roſmarinus, morſe, ſea-horſe, or wall-roſe, has the dog-teeth of the upper-jaw protruded out of the mouth. This animal is found in the ocean, within the polar circle. It grunts like a hog, and is about the ſize of a bull. 2. The monatus, or ſea-cow, has the dog-teeth not protruded. It is found in the American and Indian ocean, principally at the mouths of rivers. It feeds upon ſea-weeds, and is about twelve feet long. The females have, between the pectoral fins, two large, round, and fair breaſts; and both ſexes have the parts of generation, and the navel, perfectly reſembling thoſe of the human ſpecies: there is no doubt but all the fables concerning mermaids, mermen, and ſyrens, took their riſe from an imperfect view of this animal.

THRIPS, a genus of inſects belonging to the order of hemiptera. The beak is obſcure; the feelers are of an equal length with the breaſt; the body is linear; and it has four ſtrait wings lying croſs-ways upon the back. There are five ſpecies, diſtinguiſhed by their colour.

THROAT, the anterior part of an animal, between the head and the ſhoulders, wherein is the gullet.

THRONE, a royal ſeat, or chair of ſtate, enriched with ornaments of architecture and ſculpture, raiſed on one or more ſteps, and covered with a kind of canopy. Such are the thrones in the rooms of audience of kings and other ſovereigns.

THROWSTER, one who prepares raw ſilk for the weaver, by cleanſing and twiſting it.

THRUSH, in ornithology. See TURDUS.

THULE, of the ancients, ſuppoſed to be the iſlands of Orcades.

THUMB, in anatomy, one of the parts or extremities of the hand. See ANATOMY, p. 181.

THUMMIM. See URIM.

THUNDER, a noiſe in the regions of the air, excited by ſudden flaſhes of lightning. See ELECTRICITY, p. 480, 484.

THURINGIA LANDGRAVIATE, one of the diviſions of the circle of Upper Saxony, in Germany, having the duchy of Magdeburg on the north, and Franconia on the ſouth.

THURSDAY, the fifth day of the Chriſtian week, but the ſixth day of that of the Jews.

THURSO, a port-town of Caithneſs, in Scotland, ſituated on the Caledonian ocean, fifteen miles ſouth-weſt of Dungſby-head.

THUYA, in botany, a genus of the monœcia monadelphia claſs. The calix of the male is an amentum, that of the female a ſtrobilus; neither of them have any corolla; there is one piſtillum, and one nut ſurrounded with an emarginated wing. The ſpecies are three, all natives of warm countries.

THYMUS, in botany, a genus of the didynamia gymnoſpermia claſs. The calix is bilabiated, and the faux is ſhut up with hairs. There are eight ſpecies, two of them natives of Britain, *viz.* the ſerpillum, or common thyme; and the acinos, or wild baſil.

THYMUS, in anatomy. See ANATOMY, p. 278.

THYROARYTÆNOIDES, in anatomy. See ANATOMY, p. 301.

THYROIDE CARTILAGE. See ANATOMY, p. 300.

THYRSUS, in antiquity, the ſceptre which the poets put into the hand of Bacchus. And wherewith they furniſhed the menades in their bacchanalia.

TIARA, an ornament or habit wherewith the ancient Perſians covered their head; and which the Armenians, and kings of Pontus, ſtill wear on medals; theſe laſt, becauſe deſcended from the Perſians.

TIARA is alſo the name of the pope's triple crown.

TIBER, a great river of Italy, which runs through the pope's territories, paſſing by Perugia and Orvietto; and having viſited Rome, falls into the Tuſcan ſea at Oſtia, fifteen miles below that city.

TIBIA, in anatomy. See ANATOMY, p. 183.

TIBIALIS, in anatomy. See ANATOMY, p. 209.

TIDES. See ASTRONOMY, p. 473.

TIDE-WAITERS, or TIDESMEN, are inferior officers belonging to the cuſtom-houſe, whoſe employment it is to watch or attend upon ſhips, until the cuſtoms be paid: they get this name from their going on board ſhips, on their arrival in the mouth of the Thames or other port, and ſo come up with the tide.

TIEND, in Scots law. See LAW, Tit. xvii. 1, *&c.*

TIERCE, or TERCE, a meaſure of liquid things, as wine, oil, *&c.* containing the third part of a pipe, or forty-two gallons.

TIERCED,

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TIERCED, in heraldry, denotes the ſhield to be divided by any part of the partition-lines, as party, coupy, tranchy, or tailly, into three equal parts of different colours or metals.

TIGER, in zoology. See FELIS.

TIGRIS, a large river of Turky in Aſia, which, riſing in the mountains of Armenia, runs ſouthward, dividing Diarbeck or Meſopotamia, from Curdeſtan or the ancient Aſſyria; and having paſſed by Badgat, joins the Euphrates in Eyraca Arabic, or the ancient Chaldea.

TILBURY, a fortreſs in the county of Eſſex, ſituated on the river Thames, oppoſite to Graveſend, twenty miles eaſt of London.

TILIA, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of five petals, and the calix of five ſegments; the berry is dry, and round, with five cells, and five valves. There are two ſpecies, only one of them, *viz.* the Europæa, or lime-tree, a native of Britain.

TILLÆA, in botany, a genus of the tetrandria tetragynia claſs. The calix conſiſts of three ſegments, and the corolla of three equal petals; and there are three capſules containing three ſeeds. The ſpecies are two, none of them natives of Britain.

TILLANDSIA, in botany, a genus of the hexandria monogynia claſs. The calix conſiſts of three perſiſtent ſegments; the corolla is bell-ſhaped, with three ſegments; the capſule has one cell, containing a ſingle pappous ſeed. There are nine ſpecies, none of them natives of Britain.

TILLER *of a ſhip*, a ſtrong piece of wood faſtened in the head of the rudder, and in ſmall ſhips and boats called the helm.

TILLAGE. See AGRICULTURE, p. 54.

TIMAR, a tract or portion of land, which the grand ſegnior grants to a perſon on condition of ſerving him in a war on horſe-back. Hence, thoſe who enjoy ſuch lands are called timariots.

TIMBER, includes all kinds of felled and ſeaſoned woods.

TIME, a ſucceſſion of phænomena in the univerſe; or a mode of duration marked by certain periods or meaſures, chiefly by the motion and revolution of the ſun. See ASTRONOMY, p. 489.

TIME, in muſick, is an affection of ſound, whereby we denominate it long or ſhort, with regard to its continuance in the ſame degree of time. See MUSICK.

TIMOR, and iſland in the Indian ocean, ſituated between 122° and 126° of eaſt long, and between 8° and 10° ſouth lat.

It is in poſſeſſion of the Dutch, and ſaid to have gold mines.

TIN. See CHEMISTRY, p. 83, 105, 135.

TINCTURE, in pharmacy and chemiſtry, a ſeparation of the finer and more volatile parts of a mixed body, made by means of a proper menſtruum diſſolving and retaining the ſame.

TINCTURE, in heraldry, the hue or colour of any thing in coat armour, under which denomination may be alſo included the two metals, or and argent, becauſe they are often repreſented by yellow and white.

TINE. There are two rivers of this name; the one called North-Tine, which riſes on the borders of Scotland; and the other South-Tine, which riſes on the confines of Cumberland; the one running ſouth-eaſt, and the other north-eaſt: they unite their waters at Hexham, and continuing to run eaſt, divide the counties of Durham and Northumberland, paſſing by Newcaſtle, and falling into the German ſea at Tinmouth.

TINMOUTH, a port-town of Northumberland, ſituated on the German ſea, at the mouth of the river Tine, ſeven miles eaſt of Newcaſtle.

TINNING, the covering or lining any thing with melted tin, or with tin reduced to a very fine leaf. Looking-glaſſes are foliated, or tinned, with thin plates of beaten tin, the whole bigneſs of the glaſs, applied or faſtened thereto by means of quickſilver. See FOLIATING.

TINNITUS AURIUM. See MEDICINE, p. 156.

TINUS, in botany, a genus of the enneandria monogynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; the berry has three cells, containing one ſeed. There is but one ſpecies, a native of Jamaica.

TIPPERARY, a county of Ireland, in the province of Munſter, lying between King's-county on the north, and Waterford on the ſouth.

TIPSTAFF, an officer who attends the judges with a kind of ſtaff tipt with ſilver, and takes into his charge all priſoners who are committed or turned over at a judge's chambers.

TIRE, in the ſea-language, is a row of cannon placed along a ſhip's ſide, either above upon deck, or below, diſtinguiſhed by the epithets of upper and lower tires.

TIROL, a country of Germany, in the circle of Auſtria, about one hundred and twenty miles long, and ſixty broad, ſubject to the houſe of Auſtria: it is bounded by Swabia and Bavaria on the north.

TITANS, in the heathen mythology, the offspring of Titan, the elder brother of Saturn; upon whom, and his ſon Jupiter, they made war, in order to recover the ſovereignty of which Titan had been deprived. The poets repreſent them as a race of giants, ſprung from the earth, and invading heaven; and tell us, that Jupiter overcame them with thunder, and drove them down to the very bottom of hell.

TITHES. See TIEND.

TITLE, an appellation of dignity or quality, given to princes, and other perſons of diſtinction.

TITMOUSE, in ornithology. See PARUS.

TITUBATION, a kind of libration, or ſhaking, which the ancient aſtronomers attributed to the cryſtalline heavens, in order to account for certain irregularities which they obſerved in the motions of the planets.

TITULAR, denotes a perſon inveſted with a title, in virtue of which he holds an office or benefice, whether he perform the functions thereof or not.

TINERTON, a borough of Devonſhire, ſituated on the river Ex, thirteen miles north of Exeter. It ſends two members to parliament.

TIVIOT, or CHEVIOT-MOUNTAINS, are high hills on the borders of England and Scotland.

TMESIS, in grammar, a figure whereby a compound word is ſeparated into two parts, and one or more words placed between them: thus, for *quæcunque*, Virgil ſays, *quæ me cunque vocant terræ*, &c.

TOAD, in zoology. See RANA.

TOAD-FLAX, in botany. See ANTIRRHINUM.

TOBACCO, in botany. See NICOTIANA.

TOBAGO, a ſmall iſland in the bay of Panama, in South-

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South-America, ſituated W. long 82°, N. lat. 8°.

TOBAGO, is alſo the name of one of the Caribbee iſlands.

TOBOLSKI, the capital of Siberia, ſituated at the confluence of the rivers Tobal and Iris: E. long. 63°, N. lat. 57° 30′.

TOCAT, the capital of Amaſia, in Aſia: E. long. 37°, and N. lat. 41° 30′.

TOCKAY, a city of Hungary, ſeventy miles north-eaſt of Buda, the wines of which are eſteemed the beſt in Europe.

TOES. See ANATOMY, p. 188.

TOGA, in Roman antiquity, a wide woolen gown, or mantle; which ſeems to have been of a ſemi-circular form, without ſleeves; differing both in richneſs and largeneſs, according to the circumſtances of the wearer, and uſed only upon occaſion of appearing in public.

Every body knows that the toga was the diſtinguiſhing mark of a Roman: hence, the jus togæ, or privilege of the toga, was the ſame with the privilege of a Roman citizen, *i. e.* the right of wearing a Roman habit, and of taking, as they explain it, fire and water through the Roman empire.

TOILS, ſnares or nets uſed by hunters for catching wild beaſts, as deer, *&c.*

TOILET, a fine cloth of linen, ſilk, or tapeſtry, ſpread over the table in a bed-chamber or dreſſing-room, to undreſs and dreſs upon.

TOISE, a French meaſure containing ſix of their feet, or a fathom.

TOLEDO, a city of New Caſtile, in Spain; the archbiſhop of which is primate of Spain, *&c.* and poſſeſſes the largeſt revenue of any archbiſhop of Europe: it is ſituated in W. long. 4° 12′, and N. lat. 39° 45′.

TOLEN, the capital of an iſland of the ſame name, in the province of Zealand, in the united Netherlands, ſituated four miles north-weſt of Bergenopzoom.

TOLERATION, in matters of religion, is either civil or eccleſiaſtical. Civil toleration, is an immunity and ſafety granted by the ſtate to every ſect that does not maintain doctrines inconſiſtent with the public peace; and eccleſiaſtical toleration, is the allowance which the church grants to its members to differ in certain opinions not reputed fundamentals.

TOLLENON, among the Romans, a warlike machine, formed in this manner: One beam was fixed very deep in the earth, and on the top of it another more than twice as long, and moveable upon a centre; on one end of this croſs-beam were placed a covering of hurdles or planks, within which a few ſoldiers were put, and by pulling down the other end with ropes, theſe were raiſed above the walls of a beſieged town.

TOLU, a port-town of Terra Firma, ſituated on a bay of the North-Sea, an hundred miles ſouth-weſt of Carthagena.

TOLUIFERA, in botany, a genus of the decandria monogynia claſs. The calix is bell-ſhaped, and has five ſegments; the corolla has five petals, the loweſt being longeſt, and ſomewhat cordated; it has no ſtylus. There is but one ſpecies, a native of America.

TOMB, includes both the grave or ſepulchre wherein a defunct is interred, and the monument erected to preſerve his memory.

TOME, in matters of literature, denotes a bound book, or writing that juſt makes a volume.

TOMENTUM, among botaniſts, the downy matter which grows on the leaves of ſome plants.

TONE, or TUNE, in muſick, a property of ſound, whereby it comes under the relation of grave and acute; or it is the degree of elevation a ſound has, from the degree of ſwiftneſs of the vibrations of the part of ſonorous bodies. See MUSICK.

TONGUE, in anatomy. See ANATOMY, p. 304.

TONQUIN, a kingdom of the further India, bounded by the provinces of Yunam and Canton, in China, on the north; by Cochin China, on the ſouth; and by the kingdom of Laos, on the weſt; lying between 101° and 108° E. long. and between 17° and 26° N. lat. Its capital is Keccio, or Cachao.

TONSILS, in anatomy. See ANATOMY, p. 303.

TONSURE, in eccleſiaſtical hiſtory, a particular manner of ſhaving or clipping the hair of eccleſiaſtics or monks.

The ancient tonſure of the clergy was nothing more than polling the head, and cutting the hair to a moderate degree, for the ſake of decency and gravity: and the ſame obſervation is true, with reſpect to the tonſure of the ancient monks. But the Romaniſts have carried the affair of tonſure much farther; the candidate for it kneeling before the biſhop, who cuts the hair in five different parts of the head, *viz.* before, behind, on each ſide, and on the crown.

TOOL, among mechanics, denotes in general any ſmall inſtrument, uſed as well for making other more complex inſtruments and machines, as in moſt operations in the mechanic arts.

TOOTH, in anatomy. See ANATOMY, p. 164.

TOOTH-ACH. See MEDICINE, p. 120.

TOPARCHY, a little ſtate or ſeigniory, conſiſting only of a few cities or towns: or a petty country, governed and poſſeſſed by a toparch or lord.

TOPAZ, in natural hiſtory, a gem called by the ancients chryſolite, as being of a gold-colour.

The topaz, when perfect and free from blemiſhes, is a very beautiful and valuable gem; it is, however, very rare in this ſtate. It is of the number of thoſe gems which are found only in the round or pebble form, there never having been yet ſeen a true and genuine topaz of a columnar figure, though the far greater part of what our jewellers call ſuch, are in that form. The greateſt part of the true topazes are no larger than grains of a coarſe ſeed; among theſe there are, however, ſome met of the ſize of a pea, and ſome much larger, though theſe are very rare. It is of a roundiſh or oblong figure in its native or rough ſtate, and is uſually flatted on one ſide, and is generally of a bright and naturally poliſhed ſurface, tolerably tranſparent. They are ever of a fine yellow colour; but they have this, like the other gems, in ſeveral different degrees: the fineſt of all are of a true and perfect gold colour; but there are ſome much deeper, and others extremely pale, ſo as to appear ſcarce tinged. The oriental topaz is equal to the ruby in hardneſs, and is ſecond only to the diamond in luſtre.

TOPHUS, in medicine, denotes a chalky or ſtony concretion in any part of the body, as the bladder, kidney, *&c.* but eſpecially in the joints.

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TOPICAL MEDICINES, are the ſame with external ones, or thoſe applied outwardly to ſome diſeaſed and painful part: ſuch are plaſters, cataplaſms, unguents, *&c.*

TOPOGRAPHY, a deſcription or draught of ſome particular place, or ſmall track of land; as that of a city or town, manor or tenement, field, garden, houſe, caſtle, or the like; ſuch as ſurveyors ſet out in their plots, or make draughts of, for the information and ſatisfaction of the proprietors.

TORBAY, a fine bay in the Engliſh channel, a little eaſt of Dartmouth.

TORCELLA, a port-town of Catalonia, in Spain, ſituated at the mouth of the river Ter, in E. long. 2° 50′, and N. lat. 42°.

TORCH, a luminary uſed in ſeveral church-ceremonies, funerals, *&c.* and more uſually called flambeau.

TORCH-THISTLE, in botany. See CACTUS.

TORDYLIUM, in botany, a genus of the pentandria digynia claſs. The radii of the corolla are all hermaphrodites; the fruit is roundiſh, with a crenated edge; and the involucra are long, and undivided. There are ſeven ſpecies, only two of them natives of Britain, *viz.* the latifolium, or purple-flowered great baſtard parſley; and the nodoſum, or knotted parſley.

TORUS, in architecture, a large round moulding, uſed in the baſes of columns.

TORIES, in the hiſtory of England, a faction or party, oppoſed to the whigs. See WHIGS.

The tories are great ſticklers for the prerogative of the crown, as the whigs are for the liberties and privileges of the people; though, in truth, the principles of the moderate people of both parties do not greatly differ.

TORMENTILLA, in botany, a genus of the icoſandria polygynia claſs. The calix conſiſts of eight ſegments, and the corolla of four petals; the ſeeds are roundiſh, naked, and fixed to a ſmall dry receptacle. There are two ſpecies, both natives of Britain, *viz.* the erecta, or tormentil; and the reptans, or creeping tormentil.

Tormentil-root has an auſtere ſtyptic taſte, accompanied with an aromatic flavour: it is one of the moſt agreeable and efficacious vegetable aſtringents.

TORNADO, a ſudden and vehement guſt of wind from all points of the compaſs, frequent on the coaſt of Guinea.

TORNE, the capital of Torne Lapmark, a province of Sweden, ſituated at the mouth of the river Torne, at the bottom of the Bothnic gulph, upon a little iſland made by the river, four hundred miles north of Stockholm: E. long. 22° 45′, N lat. 65° 45′.

TORPEDO, in ichthyology. See RAJA.

TORQUE, in heraldry, denotes a round roll of cloth, twiſted and ſtuffed: ſuch is the bandage, frequently ſeen in armories, about the heads of moors, *&c.*

TORREFACTION, in chemiſtry, is the roaſting or ſcorching of a body by the fire, in order to diſcharge a part either unneceſſary or hurtful in another operation; as ſulphur is thus diſcharged from an ore, before the metal can be obtained to advantage.

TORRENT, denotes a temporary ſtream of water, falling ſuddenly from mountains, whereon there have been great rains, or an extraordinary thaw of ſnow.

TORRICELLIAN EXPERIMENT, a famous experiment made by Toricelli, a diſciple of the great Galileo, which has been already explained in the Treatiſe of PNEUMATICS, p. 485.

TORRINGTON, a market-town of Devonſhire, ſituated on the river Towbridge, twenty ſix-miles north-weſt of Exeter.

TORTOISE, in zoology. See TESTUDO.

TORTURE, a grievous pain inflicted on a criminal, or perſon accuſed, to make him confeſs the truth.

TOTNESS, a borough-town of Devonſhire, twenty-three miles ſouth-weſt of Exeter. It ſends two members to parliament.

TOUCAN, in ichthyology. See RAMPHASTOS.

TOUCAN, in aſtronomy, p. 487.

TOUCH-NEEDLES, among aſſayers, refiners, *&c.* little bars of gold, ſilver, and copper, combined together in all the different proportions and degrees of mixture; the uſe of which is to diſcover the degree of purity of any piece of gold or ſilver, by comparing the mark it leaves on the touch ſtone with thoſe of the bars.

The metals uſually tried by the touch-ſtone, are gold, ſilver, and copper, either pure, or mixed with one another in different degrees and proportions, by fuſion. In order to find out the purity or quantity of baſer metal in theſe various admixtures, when they are to be examined they are compared with theſe needles, which are mixed in a known proportion, and prepared for this uſe. The metals of theſe needles, both pure and mixed, are all made into lamina or plates, one twelfth of an inch broad, and of a fourth part of their breadth in thickneſs, and an inch and half long; theſe being thus prepared, you are to engrave on each a mark indicating its purity, or the nature and quantity of the admixture in it.

The black rough marbles, the baſaltes, or the ſofter kinds of black pebbles, are the moſt proper for touch-ſtones.

Now the method of uſing the needles and ſtone is this: the piece of metal to be tried, ought firſt to be wiped well with a clean towel, or piece of ſoft leather, that you may the better ſee its true colour; for from this alone an experienced perſon will, in ſome degree, judge beforehand what the principal metal is, and how and with what debaſed.

Then chuſe a convenient, not over large, part of the ſurface of the metal, and rub it ſeveral times very hardly and ſtrongly againſt the touch-ſtone, that in caſe a deceitful coat or cruſt ſhould have been laid upon it, it may be worn off by that friction: this, however, is more readily done by a grind-ſtone, or ſmall file. Then wipe a flat and very clean part of the touch-ſtone, and rub againſt it, over and over, the juſt mentioned part of the ſurface of the piece of metal, till you have, on the flat ſurface of the ſtone, a thin metallic cruſt, an inch long, and about an eighth of an inch broad: this done, look out the needle that ſeems moſt like to the metal under trial, wipe the lower part of this needle very clean, and then rub it againſt the touch-ſtone, as you did the metal, by the ſide of the other line, and in a direction parallel to it.

When this is done, if you find no difference between the colours of the two marks, made by your needle and the metal under trial, you may with great probability pronounce that metal and your needle to be of the ſame alloy, which is immediately known by the mark engraved

on

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on your needle. But if you find a difference between the colour of the mark given by the metal, and that by the needle you have tried, choose out another needle, either of a darker or lighter colour than the former, as the difference of the tinge on the touch-ſtone directs; and by one or more trials of this kind you will be able to determine which of your needles the metal anſwers, and thence what alloy it is of, by the mark of the needle; or elſe you will find that the alloy is extraordinary, and not to be determined by the compariſon of your needles.

TOURINE, a town of the biſhopric of Liege, thirteen miles north-eaſt of Namur.

TOURNEY, a city of Flanders, in the Auſtrian Netherlands, ſituated on the river Scheld, thirteen miles eaſt of Liſle: E. long. 3° 30′, and N. lat. 50° 37′.

TOURNEFORTIA, in botany, a genus of the pentandria monogynia claſs. The berry has two cells containing two ſeeds, perforated with two holes at the apex. There are eight ſpecies, none of them natives of Britain.

TOURNEQUET, in ſurgery, an inſtrument made of rollers, compreſſes, ſcrews, *&c.* for compreſſing any wounded part, ſo as to ſtop hæmorrhages. See SURGERY.

TOWER, a tall building, conſiſting of ſeveral ſtories, uſually of a round form, though ſometimes ſquare or polygonal.

Towers are built for fortreſſes, priſons, *&c.* as the Tower of London, the Tower of the Baſtile, *&c.*

TOWN, a place inhabited by a conſiderable number of people, being of a middle ſize between a city and village.

TOXICODENDRON, in botany. See RHUS.

TOZZIA, in botany, a genus of the didynamia angioſpermia claſs. The calix has five teeth; and the capſule is round, with one cell, containing a ſingle ſeed. There is but one ſpecies, a native of Switzerland.

TRACHEA, in anatomy. See ANATOMY, p. 300.

TRACHELIUM, in botany, a genus of the pentandria monogynia claſs. The corolla is funnel-ſhaped; the ſtigma is globular; and the capſule has three cells. There is but one ſpecies, a native of Italy.

TRACHINUS, in ichthyology, a genus belonging to the order of Jugularis. The head is ſmall, ſmooth, and compreſſed; there are ſix rays in the membrane of the gills; the plates of the opercula are ſerrated; and the anus is near the breaſt. There is but one ſpecies, *viz.* the draco, a native of the northern ocean.

TRACT, in geography, an extent of ground, or a portion of the earth's ſurface.

TRACT, in matters of literature, denotes a ſmall treatiſe, or written diſcourſe upon any ſubject.

TRADE. See COMMERCE.

TRADE-WINDS. See PNEUMATICS, p. 495.

TRADESCANTIA, in botany, a genus of the hexandria monogynia claſs. The calix conſiſts of three leaves, and the corolla of thre petals; the filaments are villous; and the capſule has three cells. There are three ſpecies; all natives of warm countries.

TRADITION, among eccleſiaſtical writers, denotes certain regulations regarding the rites, ceremonies, *&c.* of religion, which we ſuppoſe to have been handed down from the days of the apoſtles to the preſent time.

TRADITION, in Scots law. See LAW, Tit viii. 10.

TRAFFIC. See COMMERCE.

TRAGACANTH, in botany. See ASTRAGALUS.

Gum-tragacanth is the produce of this ſhrub, which grows to about four feet high, and has a firm and robuſt ſtem, with numerous branches. The gum is brought to us in long and ſlender pieces, of a flatted figure, more or leſs; and theſe not ſtrait, or rarely ſo; but commonly twiſted and contorted various ways, ſo as to reſemble worms.

Tragacanth has the ſame virtues with gum-arabic, but in a greater degree. It greatly inſpiſſates and obtunds the acrimony of the humours, and is therefore found of vaſt ſervice in inveterate coughs, and other diſorders of the breaſt.

TRAGEDY, a dramatic poem, repreſenting ſome ſignal action performed by illuſtrious perſons, and which has frequently a fatal iſſue, or end. See COMPOSITION.

TRAGI-COMEDY, a dramatic piece partaking of the nature both of tragedy and comedy; the event whereof is not bloody or unhappy, and wherein is admitted a mixture of leſs ſerious characters.

TRAGIA, in botany, a genus of the monœcia tetrandria claſs. The calix of the male conſiſts of three ſegments; that of the female of five; neither of them have any corolla; the ſtylus is trifid; and the capſule has three cells, with ſolitary ſeeds. There are five ſpecies, none of them natives of Britain.

TRAGOPOGON, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is naked; the calix is ſimple, and conſiſts of many leaves; and the pappus is feathered. There are eleven ſpecies, two of them natives of Britain, *viz.* the pratenſe, or yellow goat's-beard; and the porrifolium, or purple goat's-beard.

TRAGUS, in anatomy. See ANATOMY, p. 295.

TRAJAN COLUMN, a famous hiſtorical column erected in Rome, in honour of the emperor Trajan. It is of the Tuſcan order, though ſomething irregular; its height is eight diameters, and its pedeſtal Corinthian: it was built in a large ſquare there, called Forum Romanum. Its baſe conſiſts of twelve ſtones, of an enormous ſize, and it is raiſed on a ſocle, or foot of eight ſteps; within ſide is a ſtair-caſe, illuminated with forty four windows. It is 140 feet high, which is thirty-five ſhort of the Antonine column, but the workmanſhip of the former is much more valued. It is adorned from top to bottom with baſſo relievo's, repreſenting the great actions of that emperor againſt the Dacæ.

TRAJECTORY *of a comet*, is its path or orbit, or the line it deſcribes in its motion. See ASTRONOMY, p. 444.

TRAIN, a line of gun-powder, ſaid to give fire to a quantity thereof, in order to do execution by blowing up earth, works, buildings, *&c.*

TRAIN OF ARTILLERY, includes the great guns, and other pieces of ordnance belonging to an army in the field.

TRAIN-OIL, the oil procured from the blubber of a whale by boiling.

TRAINING, or TRACING, in mineralogy, a term uſed by the miners, to expreſs the tracing up the mineral appearances on the ſurface of the earth to their head, or original place, and there finding a mine of the metal they contain. See MINE.

TRALOS MONTES, a province of Portugal, bounded by Spain on the north-eaſt; by the province of Beira on the ſouth; and by Entreminho Douro on the weſt.

TRANSACTION, an accommodation of ſome buſineſs,

or

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or diſpute between two parties, by a mutual and voluntary agreement between them.

TRANSCENDENTAL, or TRANSCENDANT, ſomething elevated, or raiſed above other things; which paſſes and tranſcends the nature of other inferior things.

TRANSCRIPT, a copy of any original writing, particularly that of an act, or inſtrument, inſerted in the body of another.

TRANSFER, in commerce, *&c.* an act whereby a perſon ſurrenders his right, intereſt, or property in any thing moveable or immoveable to another.

TRANSFORMATION, in general, denotes a change of form, or the aſſuming a new form different from a former one. The chemiſts have been for a long time ſeeking the transformation of metals; that is, their tranſmutation, or the manner of changing them into gold.

TRANSFERENCE, in Scots law. See LAW, Tit. XXX. 25.

TRANSFUSION, the act of pouring a liquor out of one veſſel into another.

TRANSGRESSION, an offence againſt ſome law, or a breach or violation thereof.

TRANSILVANIA, a principality bounded by the Carpathian mountains, which divide it from Poland on the north; by Moldavia on the eaſt; by Walachia, and part of Hungary, on the ſouth; and by another part of Hungary on the north; being about 120 miles long, and almoſt as many broad; and lying between 22 and 25 degrees eaſt long. and between 45 and 48 of north lat.

TRANSIT, in aſtronomy, ſignifies the paſſage of any planet, juſt by, or over a fixed ſtar, or the ſun, and of the moon in particular, covering or moving over any planet. See ASTRONOMY, p. 438.

TRANSITIVE, in grammar, an epithet applied to ſuch verbs as ſignify an action which paſſes from the ſubject that does it, to or upon another ſubject which receives it. Under the head of verbs tranſitive, come what we uſually call verbs active and paſſive; other verbs, whoſe action does not paſs out of themſelves, are called neuters.

TRANSLATION, the act of transferring or removing a thing from one place to another; we ſay the tranſlation of a biſhop's ſee, a council, a ſeat of juſtice, *&c.*

TRANSLATION is alſo uſed for the verſion of a book or writing out of one language into another.

TRANSMARINE, ſomething that comes from, or belongs to, the parts beyond ſea.

TRANSMIGRATION, the removal or tranſlation of a whole people into another country, by the power of a conqueror.

TRANSMIGRATION, is particularly uſed for the paſſage of a ſoul out of one body into another, being the ſame with what we otherwiſe call metempſychoſis. See METEMPSYCHOSIS.

TRANSMUTATION, the act of transforming or changing one nature into another.

TRANSMUTATION, in alchemy, denotes the art of changing or exalting imperfect metals into gold or ſilver. This is alſo called the grand operation, and, they ſay, is to be effected with the philoſopher's ſtone.

TRANSOM, among builders, denotes the piece that is framed acroſs a double light window.

TRANSOM, in a ſhip, a piece of timber which lies athwart the ſtern, between the two faſhion-pieces, directly under the gun-room port. See SHIP-BUILDING.

TRANSPARENCY, in phyſics, a quality in certain bodies, whereby they give paſſage to the rays of light; in contradiſtinction to opacity, or that quality of bodies which renders them impervious to the rays of light.

TRANSPIRATION, the inſenſible, or almoſt inſenſible, paſſage of an excrementitious matter through the pores of the ſkin, called alſo perſpiration.

TRANSPLANTATION, in agriculture and gardening, the act of removing trees or plants from the places where they were ſowed, or raiſed, and planting them in others.

TRANSPORTATION, the act of conveying or carrying a thing from one place to another.

TRANSPOSITION, in grammar, a diſturbing or diſlocating of the words in a diſcourſe, or a changing of their natural order of conſtruction, to pleaſe the ear by rendering the contexture more eaſy, ſmooth, and harmonious.

TRANSPOSITION, in muſick See MUSICK.

TRANSUBSTANTIATION, in theology, the converſion or change of the ſubſtance of the bread and wine in the euchariſt, into the body and blood of Jeſus Chriſt, which the Romiſh church hold is wrought by the conſecration of the prieſt.

Action of TRANSUMPT, in Scots law. See LAW, Tit. XXX. 27.

TRANSVERSALIS, in anatomy. See ANATOMY, p. 193.

TRANSVERSE, ſomething that goes acroſs another, from corner to corner: thus bends and bars, in heraldry, are tranverſe pieces or bearings: the diagonals of a parallelogram or a ſquare, are tranſverſe lines.

TRAPA, in botany, a genus of the tetrandria monogynia claſs. The corolla conſiſts of four petals; and the calix of four ſegments; and the nut has four ſpines oppoſite to one another. There is but one ſpecies, a native of Aſia.

TRAPEZIUM, in geometry, a plane figure contained under four unequal right lines.

TRAPEZIUS, in anatomy. See ANATOMY, p. 193.

TRAVERSE, or TRANSVERSE, in general, denotes ſomething that goes athwart another; that is, croſſes and cuts it obliquely.

TRAVERSE, in navigation, is a compound courſe, wherein ſeveral different ſucceſſive courſes and diſtances are known. See NAVIGATION.

TRAVESTY, a French term, derived from the verb *traveſtir*, to diſguiſe one's ſelf, or to appear in maſquerade: and hence, traveſty is applied to the diſfiguring of an author, or the tranſlating him into a ſtyle and manner different from his own, by which means it becomes difficult to know him.

TREACLE. See THERIACA.

Some alſo give the name treacle to melaſſes.

TREASON, in general, ſignifies betraying; but is more particularly uſed for the act or crime of infidelity to one's lawful ſovereign. See LAW, Tit. XXXIII. 9.

TREASURE, in general, denotes a ſtore or ſtock of money in reſerve.

TREASURER, an officer to whom the treaſure of a prince or corporation is committed, to be kept, and duly diſpoſed of.

The lord high treaſurer of Great Britain, or firſt commiſſioner of the treaſury, when in commiſſion, has under his charge and government all the kings revenue, which is kept in the exchequer. He holds his place during the king's pleaſure, being inſtituted by the delivery of a white

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ſtaff to him: he has the check of all the officers employed in collecting the cuſtoms and other royal revenues; and in his gift and diſpoſition are all the officers of the cuſtoms in the ſeveral ports of the kingdom; eſcheators in every county are nominated by him; he alſo makes leaſes of the lands belonging to the crown.

TREASURY, the place wherein the revenues of a prince are received, preſerved, and diſburſed.

Lords of the TREASURY. In lieu of one ſingle director and adminiſtrator of his majeſty's revenues under the title of lord high treaſurer, it is at preſent thought proper to put that office in commiſſion, *i. e.* to appoint ſeveral perſons to diſcharge it with equal authority, under the title of lords commiſſioners of the treaſury.

TREATISE, a ſet diſcourſe in writing on any ſubject. A treatiſe is ſuppoſed more expreſs, formal, and methodical than an eſſay, but leſs ſo than a ſyſtem.

TREATY, a covenant between two or more nations; or the ſeveral articles or conditions ſtipulated and agreed upon between ſovereign powers.

TREBLE, in muſick, the higheſt or acuteſt of the four parts in ſymphony, or that which is heard the cleareſt and ſhrilleſt in a concert.

TREE, the firſt and largeſt of the vegetable kind, conſiſting of a ſingle trunk, out of which ſpring forth branches and leaves.

TREFOIL. See TRIFOLIUM.

Marſh-TREFOIL, in botany. See MENYANTHES.

Shrub-TREFOIL, in botany. See CYTISUS.

TREMELLA, LAVER, in botany, a genus of ſea-plants, of a middle nature, between the alga and conferva, being of a pellucid and membranaceous, and frequently of a gelatinous ſtructure. There are nine ſpecies, ſix of them natives of Britain.

TREMOR, an involuntary ſhaking, chiefly of the hands and head, ſometimes of the feet, and ſometimes of the tongue and heart.

TRENCHES, in fortification, are ditches cut by the beſiegers, that they may approach more ſecurely to the place attacked; whence they are alſo called lines of approach.

TRENT BISHOPRICK, a province of Germany, in the circle of Auſtria, ſituated on the Alps, which divides Italy from Germany, and ſometimes reckoned part of Italy; it is bounded by Tyrol on the north, by the territory of Venice on the eaſt and ſouth, and by the country of the Griſons on the weſt, being ſeventy miles long and fifty broad, ſubject to the houſe of Auſtria.

TRENT is alſo the name of one of the largeſt rivers in Great Britain, riſing in the moor-lands of Staffordſhire, and running ſouth-eaſt by Newcaſtle Under Line, divides that country almoſt into two equal parts; then entering Derbyſhire, turns about to the north-eaſt; and having run the whole length of Nottinghamſhire, continues its courſe due north; at laſt joining the river Ouſe, and ſeveral others, it changes its name to that of Humber, and falls into the German ſea below Hull.

TREPAN. See SURGERY, p. 664.

TREPANNING, in ſurgery. See SURGERY, *ibid.*

TRESPASS, in law, ſignifies any tranſgreſſion of the law, under treaſon, felony, or miſpriſion of either; but it is moſt commonly uſed for any wrong or damage that is done by one private perſon to another, or to the king in his foreſt, *&c.*

TRESSURE, in heraldry, a diminutive of an orle, uſually held to be half the breadth thereof. See it repreſented in Plate CXLVII. fig. 20.

TRET, in commerce, an allowance made for the waſte, or the dirt, that may be mixed with any commodity, which is always four pounds in every one hundred and four pounds weight.

TRIAL, in law, the examination of a cauſe, civil or criminal, according to the laws of the land, before a proper judge: or, it is the manner and order obſerved in the hearing and determining of cauſes.

TRIANDRIA, in botany. See BOTANY, p. 635.

TRIANGLE, in geometry, a figure of three ſides and three angles. See GEOMETRY, p. 686.

TRIANGULARIS, in anatomy. See ANATOMY, p. 306.

TRIBE, in antiquity, a certain quantity or number of perſons, when a diviſion is made of a city or people into quarters or diſtricts.

TRIBRACHYS, in ancient poetry, a foot conſiſting of three ſyllables, and thoſe all ſhort; as *melius*.

TRIBULUS, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of five ſegments, and the corolla of five open petals; it has no ſtylus; and there are five gibbous, briſtly capſules, containing many ſeeds. There are four ſpecies, none of them natives of Britain.

TRIBUNAL, in general, denotes the ſeat of a judge, called in our courts *bench*.

TRIBUNE, among the ancient Romans, a magiſtrate choſen out of the commons, to protect them againſt the oppreſſions of the great, and to defend the liberty of the people againſt the attempts of the ſenate and conſuls.

The tribunes of the people were firſt eſtabliſhed in the year of Rome 259. The firſt deſign of the creation was to ſhelter the people from the cruelty of uſurers, and to engage them to quit the Aventine mount, whither they had retired in diſpleaſure.

Their number, at firſt, was but two; but the next year, under the conſulate of A. Poſthumus Aruncius and Caſſius Viſcellinus, there were three more added; and this number of five was afterwards increaſed by L. Trebonius to ten. The appellation *tribune* was given them, by reaſon they were at firſt choſen out of the tribunes of the army.

Military TRIBUNE, an officer in the Roman army, who commanded in chief over a body of forces, particularly the diviſion of a legion, much the ſame with our colonel, or the French meſtre de camp.

TRIBUTARY, one who pays tribute to another, in order to live in peace with him, or ſhare in his protection.

TRIBUTE, a tax or impoſt which one prince or ſtate is obliged to pay to another as a token of dependence, or in virtue of a treaty, and as a purchaſe of peace.

TRICEPS, in anatomy. See ANATOMY, p. 205.

TRICHOSTEMA, in botany, a genus of the didynamia gymnoſpermia claſs. The upper lip of the corolla is falcated; and the ſtamina are very long. There are two ſpecies, both natives of America.

TRICUSPIDES VALVE, in anatomy. See ANATOMY, p. 279.

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TRIDENT, an attribute of Neptune, being a kind of ſceptre which the painters and poets put into the hands of that god, in form of a ſpear, or fork, with three teeth; whence the word.

TRIEMIMERIS, a kind of cæſura in Latin verſe, wherein after the firſt foot of the verſe there remains an odd ſyllable, which helps to make up the next foot.

TRIENNIAL, an epithet applied chiefly to offices or employments which laſt for threee years.

TRIENS, in antiquity, a copper money of the value of one third of an as, which on one ſide bore a Janus's head, and on the other a water-rat.

TRIENTALIS, in botany, a genus of the heptandria monogynia claſs. The calix conſiſts of ſeven leaves, and the corolla of ſeven equal plane ſegments; and the berry is dryiſh. There are two ſpecies, none of them natives of Britain.

TRIERS, or TREVES, the capital of the electorate of Triers in Germany, ſituated on the river Moſelle, ſixty miles ſouth of Cologne: E long. 6° 10′, N. lat. 49° 55′.

TRIESTE, a port-town of Iſtria, ſituated on the gulph of Venice, ſixty miles north-eaſt of that city.

TRIFOLIUM, in botany, a genus of the diadelphia decandria claſs. The flowers are ſubcapitated; the pod is hardly longer than the calix, and deciduous. There are 43 ſpecies, 16 of them natives of Britain.

TRIGA, in antiquity, denotes a kind of carr, or chariot, drawn by three horſes; whence the name.

TRIGLA, in ichthyology, a genus of fiſhes, belonging to the order of thoracicæ. The head is loricated with rough lines, and there are ſeven rays in the membrane of the gills. There are nine ſpecies.

TRIGLOCHIN, in botany, a genus of the hexandria trigynia claſs. The calix conſiſts of three leaves, and the corolla of three petals; and it has no ſtylus. There are two ſpecies, both natives of Britain, *viz.* the paluſtre, or arrow-headed graſs; and the maritimum, or ſea ſpiked graſs.

TRIGLYPHS, in architecture, a ſort of ornaments repeated at equal intervals in the Doric freeze.

TRIGONELLA, in botany, a genus of the diadelphia decandria claſs. The vexillum and alæ are nearly equal, open, and in the form of a corolla, with three petals. There are 10 ſpecies, none of them natives of Britain.

TRIGONOMETRY.

TRIGONOMETRY is that part of geometry which teaches how to meaſure the ſides and angles of triangles.

Trigonometry is either plane or ſpherical, according as the triangles are PLANE or SPHERICAL; of each whereof we ſhall treat in order.

PLANE TRIGONOMETRY.

PLANE Trigonometry, or that which teaches the menſuration of plane triangles, is commonly divided into *rectangular* and *oblique-angular*.

Of RECTANGULAR PLANE TRIGONOMETRY.

IF in any right-angled triangle, ABC, (Plate CLIX. fig. 1. n° 1.) the hypothenuſe be made the radius, and with that a circle be deſcribed on the one end, A, as a centre; then, it is plain, that BC will be the ſine of the angle BAC; and if with the ſame diſtance, and on the end B as a centre, a circle be deſcribed, it is plain, that AC will be the ſine of the angle ABC; therefore, in general, if the hypothenuſe of a right-angled triangle be made the radius, the two legs will be the ſines of their oppoſite angles.

Again, if in a right-angled triangle DEF (*ibid.* n° 2.) one of the legs, as DF, be made the radius, and on the extremity D (at one of the oblique angles, *viz.* that which is formed by the hypothenuſe and the leg made radius) as a centre, a circle be deſcribed; it is plain, that the other leg, EF, will be the tangent of the angle at D, and the hypothenuſe DE will be the ſecant of the ſame angle. The ſame way, making the leg EF the radius, and on the center E deſcribing a circle, the other leg DF will become the tangent of the angle at E, and the hypothenuſe DE the ſecant of the ſame.

The chord, ſine, tangent, *&c.* of any arch, or angle, in one circle, is proportionable to the chord, ſine, tangent, *&c.* of the ſame arch in any other circle: from which, and what has been ſaid above, the ſolutions of the ſeveral caſes of rectangular trigonometry naturally follow.

Since trigonometry conſiſts in determining angles and ſides from others given, there ariſe various caſes; which being ſeven in rectangular-trigonometry, are as follow.

CASE I. The angles, and one of the legs, of a right-angled triangle being given, to find the other leg.

EXAMPLE. In the triangle ABC (*ibid* n° 3.) right-angled at B, ſuppoſe the leg AB=86 equal parts, as feet, yards, miles, *&c.* and the angle A=33° 40′; required the other leg BC, in the ſame parts with AB.

I *Geometrically:* Draw AB=86, from any line of equal parts; upon the point B, erect the perpendicular BC; and, laſtly, from the point A, draw the line AC, making with AB an angle of 33° 40′; and that line produced will meet BC in C, and ſo conſtitute the triangle. The length of BC may be found by taking it in your compaſſes, and applying it to the ſame line of equal parts that AB was taken from.

II. *By calculation:* Firſt, by making the hypothenuſe AC radius, the other two legs will be the ſines of their oppoſite angles, *viz.* AB the ſine of C, and CB the ſine of A. Now ſince the ſine, tangent, *&c.* of any arch in one circle is proportionable to the ſine, tangent, *&c.* of the ſame arch in any other circle, it is plain the ſines of the angles A and C in the circle deſcribed by the radius AC, muſt be proportional to the ſine of the ſame arches or angles, in the circle, that the table of artificial ſines, *&c.* was calculated for; ſo the proportion for finding BC will be

S, C : AB :: S, A : BC

i. e. as the ſine of the angle C in the tables, is to the length of AB (or ſine of C in the circle whoſe radius is AC) ſo is the ſine of the angle A in the tables, to the length of BC

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BC (or fine of the ſame angle in the circle whoſe radius is AC.) Now the angle A being 33° 40′, the angle C muſt be 56° 20′; therefore looking in the table of artificial fines, &c. for the fines of the two angles, and in the table of logarithms for the logarithm of 86 the given leg, we ſhall find, by proceeding according to the foregoing proportion, that the required leg BC is 57.28; and the operation will ſtand as follows:

1.93450	AB	86
9.74380	S, A	33° 40′
11.67830		
9.92027	S, C	56° 20′
1.75803	BC	57.28

Secondly, making AB the radius, it is plain BC, the leg required, will be the tangent of the given angle A; and ſo the proportion for finding BC, when AB is made the radius, will be:

R : T, A :: AB : BC

i. e. as the radius in the tables, is to the tangent of the angle A in the ſame; ſo the length of BA, or radius in the ſcheme, to the length of BC or tangent of A in the ſcheme: therefore looking in the tables for the parts given in the foregoing proportion, and proceeding with them according to that rule, we ſhall find BC to be 57.28 as before, and the operation will be as follows:

9.82352	T, A	33° 40′
1.93450	AB	86
11.75802		
10.00000	Rad.	90°
1.75802	BC	57.28

Laſtly, by making BC, the leg required, the radius, it is plain that AB will be the tangent of C, and the proportion for finding BC will be as follows:

T, C : R :: AB : BC

i. e. as the tangent of C	56°, 20′	10.17648
is to radius	90°	10.00000
ſo is the length of AB	86	1.93450
		11 93450
		10 17648
to the length of BC	57.28	1.75802

CASE II. The angles and one of the legs given, to find the hypothenuſe.

EXAMPLE: In the triangle ABC, (*ibid.* n° 4.) ſuppoſe AB 124, and the angle A 34° 20′; conſequently the angle C 55° 40′, required the hypothenuſe AC, in the ſame parts with AB.

I. *Geometrically:* This caſe is conſtructed after the ſame manner with the former; and the hypothenuſe, AC, is found, by taking its length in your compaſſes, and applying that to the ſame line of equal parts from which AB was taken.

II. *By calculation:* Firſt, making AC the radius, we ſhall have the following proportion for finding AC, *viz.*

S, C : R :: AB : AC

i. e. as the fine of C	55° 40′	9.91686
is to radius	90°	10 00000
ſo is AB	124	2.09342
to AC	150.2	2.17656

Secondly, making AB the radius, we have this proportion, *viz.*

R : ſec. A :: AB : AC.

i. e. as the radius	90°	10.00000
to the ſecant of A	34° 20′	10.08314
ſo is AB	124	2.09342
to AC	150.2	2.17656

This may alſo be done, without the help of the ſecants: for ſince R : ſec. :: Co-S. : R; therefore, the former proportion will become,

Co-S, A : R :: AB : AC.

i. e. as the co-fine of A	34°, 20′	9.91686
is to the radius	90°	10.00000
ſo is AB	124	2.09342
to AC	150.2	2.17656

Thirdly, making BC the radius, we have the following proportion, *viz.*

T, C : ſec. C :: AB : AC.

i. e. as the tangent of C	55°, 40′	10.16558
is to ſec. C	55°, 40′	10.24872
ſo is AB	124	2.09342
to AC	150.2	2.17656

This likewiſe may be done without the help of ſecants; for ſince T, : Sec. : : S, : R; therefore the former analogy will be reduced to this, *viz.*

S, C : R :: AB : AC,

where no ſecants do appear; and it coincides with that in the firſt ſuppoſition of this caſe, ſo we ſhall not repeat the operation.

CASE III. The angles and hypothenuſe given, to find either of the legs.

EXAMPLE. In the triangle ABC, (*ibid.* n° 4.) ſuppoſe the hypothenuſe AC = 146, and the angle A = 36° 25′; conſequently the angle C = 53° 35′; required the leg AB.

I. *Geometrically:* Draw the line AB at pleaſure, and make the angle BAC equal to 36° 25′; then take AC equal to 146 from any line of equal parts; laſtly, from the point C, let fall the perpendicular CB, on the line AB. So the triangle is conſtructed, and AB may be meaſured from the line of equal parts.

II. *By calculation:* Firſt, making AC the radius, we ſhall have the following proportion, *viz.*

R : S, C :: AC : AB.

i e. As radius	90°	10.00000
to the fine of C	53° 35′	9.90565
ſo is AC	146	2.16435
to AB	117,5	2.07000

Secondly, making AB the radius, we have the following analogy, *viz*

Sec. A : R :: AC : AB.

i. e. As the ſecant of A	36° 25′	10.09435
is to radius	90°	10.00000
ſo is AC	146	2.16435
to AB	117.5	2.07000

This may alſo be done without the help of ſecants; for ſince ſec. : R :: R : Co-S, the former proportion may be reduced to this, *viz.*

R : Co-S, A :: AC : AB,

which is the ſame with the proportion in the firſt ſuppoſition.

Thirdly, by ſuppoſing BC the radius, we have the following proportion, *viz.*

Sec. C : T, C :: AC : AB;

i. e. as the ſecant of C	53°, 35′	10.22647

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is to the tangent of C	53°, 35′	10.13212
ſo is AC	146	2.16435
to AB	117.5	2.07000

Case IV. The two legs being given, to find the angles.

Example. In the triangle ABC, (*ibid* n° 5.) ſuppoſe AB 94 and BC 56, required the angles A and C.

I. *Geometrically*: Draw AB equal to 94, from any line of equal parts; then from the point B raiſe BC perpendicular to AB, and take BC from the former line of equal parts equal to 56; laſtly, join the points A and C with the ſtraight line AC: ſo the triangle is conſtructed, and the angles may be meaſured by a line of chords.

II. *By calculation*: Firſt, ſuppoſing AB the radius, we have this analogy, *viz.*

AB : BC :: R : T, A,

i. e. as AB	94	1.97313
is to BC	56	1.74819
ſo is the radius	90°	10.00000
to the tangent of A	30° 47′	9.77506

Secondly, making BC the radius, we have this proportion, *viz.*

BC : BA :: R : T, C.

i. e. as BC	56	1.74819
is to AB	94	1.97313
ſo is the radius	90°	10.00000
to the tangent of C	59° 13′	10.22494

Case V. The hypothenuſe and one of the legs given, to find the angles.

Example. In the triangle DEF, (*ibid.* n° 6.) ſuppoſe the leg DE=83, and the hypothenuſe DF=126; required the angles D and F.

I. *Geometrically*: Draw the line DE=83 from any line of equal parts; and from the point E raiſe the perpendicular EF: then take the length of DF=126, from the ſame line of equal parts; and ſetting one foot of your compaſſes in D, with the other croſs the perpendicular EF in E: laſtly, join D and F; and the triangle being thus conſtructed, the angles may be meaſured by a line of chords.

II. *By calculation*: Firſt, making DF the radius, we ſhall have this proportion, *viz.*

D F : D E :: R : S, F.

i. e. as DF	126	2.10037
is to DE	83	1.91908
ſo is radius	90°	10.00000
to the ſine of F	41° 12′	9.81871

Secondly, by ſuppoſing DE the radius, we have the following analogy, *viz.*

D E : D F :: R : Sec. D.

i. e. as DE	83	1.91908
is to DF	126	2.10037
ſo is radius	90°	10.00000
to the ſecant of D	48° 48′	10 18129

This may be done without the help of ſecants; for ſince R : ſec. :: Co-S, : R, the foregoing analogy will become this, *viz.*

DF : DE :: R : Co-S, D.

which gives the ſame anſwer with that deduced from the firſt ſuppoſition.

Case VI. The two legs being given, to find the hypothenuſe.

Example: In the triangle ABD, (*ibid.* n° 7.) ſuppoſe the leg AB=64, and BD=56: required the hypothenuſe.

I. *Geometrically*: The conſtruction of this caſe is performed the ſame way as in the fourth caſe, and the length of the hypothenuſe is found by taking it in your compaſſes, and applying it to the ſame line of equal parts that the two legs were taken from.

II. *By calculation*: This caſe being a compound of the fourth and ſecond caſes, we muſt firſt find the angles by the fourth, thus:

AB : DB :: R : T, A.

i. e. as the leg AB	64	1.80618
is to the leg DB	56	1.74819
ſo is the radius	90	10.00000
to the tangent of A	41° 11′	9.94201

Then by the ſecond caſe we find the hypothenuſe required thus:

S, A : R :: B D : A D,

i. e. as the ſine of A	41°, 11′	9.81854
is to the radius	90°	10.00000
ſo is the leg B D	56	1.74819
to the hypoth. AD	85.05	1.92965

This caſe may alſo be ſolved after the following manner, *viz.*

From twice the logarithm of the greater ſide AB	3.61236
ſubtract the logarithm of the leſſer ſide BD	1.74819
and there remains	1.86417

the logarithm of 73.15; to which adding the leſſer ſide BD, we ſhall have 189.15, whoſe logarithm is 2.11093

to which add the logarithm of the leſſer ſide B D	1.74819
and the ſum will be	3.85912
the half of which is	1.92956

the logarithm of the hypothenuſe required.

Or it may be done by adding the ſquare of the two ſides together, and taking the logarithm of that ſum, the half of which is the logarithm of the hypothenuſe required: thus, in the preſent caſe,

the ſquare of A B (64) is	4096
the ſquare of B D (56) is	3136
the ſum of theſe ſquares is	7232
the logarithm of which is	3.85926
the half of which is	1.92962=

to the logarithm of 85.05, the length of the hypothenuſe required.

Case VII. The hypothenuſe and one of the legs being given, to find the other leg.

Example. In the triangle BGD, (*ibid.* n° 8.) ſuppoſe the leg BG=87, and the hypothenuſe BD=142; required the leg DG.

I. *Geometrically*: The conſtruction here is the ſame as in caſe V. the ſame things being given; and the leg DG is found by taking its length in your compaſſes, and applying that to the ſame line of equal parts the others were taken from.

II. *By calculation*: The ſolution of this caſe depends upon the 1ſt and 5th; and firſt we muſt find the oblique angles by caſe 5th thus:

D B : B G :: R : S, D.

i. e. as the hypoth. D B	142	2.15229

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is to the leg BG	87	1.93952
ſo is radius	90°,	10 00000
to the ſine of D	37°, 47′	97.8723

Then by caſe 1ſt, we find the leg DG required, thus:

R : S, B :: B D : D G,

i. e. as radius	90°	10.00000
is to the ſine of B	52°, 13′	9.89781
ſo is the hypoth. DB	142	2.15229
to the leg DG	112.2	2,05010

The leg DG may alſo be found in the following manner, *viz.*

To th: log of the ſum of the hypothenuſe and given leg, *viz.* 229 - -	2.35984
add the logarithm of their difference, *viz.* 55	1.74036
and their ſum is	4.10020
the half of that is	2.05010

the log. of 112.2 the leg required.

Or it may be done by taking the ſquare of the given leg from the ſquare of the hypothenuſe, and the ſquare root of the remainder is the leg required: thus, in the preſent caſe,

The ſquare of the hypothenuſe (142) is	20164
The ſquare of the leg BG (87) is	7569
Their difference is	12595
Whoſe logarithm is	4.10020
The half of which is	2.05010

which anſwers to the natural number 112.2 the leg required.

Thus have we gone through the ſeven caſes of right-angled plane trigonometry; from which we may obſerve, 1. That to find a ſide, when the angles are given, any ſide may be made the radius. 2. To find an angle, one of the given ſides muſt of neceſſity be made the radius.

Of Oblique-angled Plane Trigonometry.

In oblique-angled plane trigonometry there are ſix caſes; but before we ſhew their ſolution, it will be proper to premiſe the following theorems.

Theorem I. In any triangle ABC (*ibid.* fig. 2. n° 2.) the ſides are proportional to the ſines of the oppoſite angles: thus, in the triangle A B C, A B : B C :: S, C : S, A, and A B : A C :: S, C : S, B : alſo A C : B C :: S, B : S, A.

Demonſtration. Let the triangle ABC be inſcribed in a circle; then, it is plain (from the property of the circle) that the half of each ſide is the ſine of its oppoſite angle: but the ſines of theſe angles, in tabular parts, are proportional to the ſines of the ſame in any other meaſure; therefore, in the triangle ABC, the ſines of the angles will be as the halves of their oppoſite ſides; and ſince the halves are as the wholes, it follows, that the ſines of the angles are as their oppoſite ſides; *i. e.* S, C : S, A :: A B : B C, *&c.*

Theor. II. In any plane triangle, as ABC (*ibid.* n° 2.) the ſum of the ſides, AB and BC, is to the difference of theſe ſides, as the tangent of half the ſum of the angles BAC, ABC, at the baſe, is to the tangent of half the difference of theſe angles.

Demon. Produce AB; and make BH equal to BC; join HC, and from B let fall the perpendicular BE; through B draw BD parallel to AC, and make HF equal to CD, and join BF; alſo take BI equal to BA, and draw IG parallel to BD or AC.

Then it is plain that AH will be the ſum, and HI the difference of the ſides AB and BC; and ſince HB is equal to BC, and BE perpendicular to HC, therefore HE is equal to EC; and BD being parallel to AC and IG, and AB equal to BI, therefore CD or HF is equal to GD, and conſequently HG is equal to FD, and half HG is equal to half FD or ED. Again, ſince HB is equal to BC, and BE perpendicular to HC, therefore the angle EBC is half the angle HBC; but the angle HBC is equal to the ſum of the angles A and C, conſequently the angle EBC is equal to half the ſum of the angles A and C. Alſo, ſince HB is equal to BC, and HF equal to CD, and the included angles BHF BCD equal, it follows that the angle HBF is equal to the angle DBC, which is equal to BCA; and ſince HBD is equal to the angle A, and HBF equal to BCA, therefore FBD is the difference, and EBD half the difference of the two angles A and BCA: ſo making EB the radius, it is plain EC is the tangent of half the ſum, and ED the tangent of half the difference of the two angles at the baſe. Now IG being parallel to AC, the triangles HIG and HAC will be equiangular; conſequently AH : IH :: CH : GH; but the wholes are as their halves, therefore AH : IH :: ½CH : ½GH; and ſince ½CH is equal to EC, and ½ GH equal to ½ FD=ED, therefore AH : IH :: EC : ED. Now AH is the ſum, and IH the difference of the ſides; alſo EC is the tangent of half the ſum, and ED the tangent of half the difference of the two angles at the baſe; conſequently, in any triangle, as the ſum of the ſides is to their difference, ſo is the tangent of half the ſum of the angles at the baſe to the tangent of half their difference.

Theorem III. If to half the ſum of two quantities be added half their difference, the ſum will be the greater of them; and if from half their ſum be ſubtracted half their difference, the remainder will be the leaſt of them. Suppoſe the greater quantity to be $x=8$, and the leſſer $z=6$; then is their ſum 14, and difference 2:

wherefore, adding $\frac{14}{2}=7$ to $\frac{2}{2}=1$, we get 8 the greateſt of the two quantities:

and, in the ſame manner, $\frac{14}{2}-\frac{2}{2}=7-1=6$, the leaſt of the two quantities.

Theor. IV. In any right-lined triangle, ABD (*ibid.* n° 3.) the baſe AD is to the ſum of the ſides AB and BD, as the difference of the ſides is to the difference of the ſegments of the baſe made by the perpendicular BE, *viz.* the difference between AE ED.

Demon. Produce DB till BG be equal to BA the leſſer leg; and on B as a centre, with the diſtance BA or BG, deſcribe the circle AGHF, which will cut BD and AD in the points H and F; then it is plain GD is the ſum, and HD the difference of the ſides; alſo ſince AD is equal to EF, therefore FD is the difference of the ſegments of the baſe; but AD : GD :: HD : FD; therefore the baſe is to the ſum of the ſides, *&c.* as was to be proved.

Having eſtabliſhed theſe preliminary theorems, we ſhall now proceed to the ſolution of the ſix caſes of oblique-angled plane trigonometry.

Case I. In any oblique-angled plane triangle, two ſides

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and an angle oppoſite to one of them being given, to find the angle oppoſite to the other.

EXAMPLE. In the triangle ABC (*ibid.* n° 4.) ſuppoſe AB=156, BC=84, and the angle C (oppoſite to AB)=56° 30′; required the angle A, oppoſite to BC.

2. *Geometrically:* Draw the line AC, and at any point of it, ſuppoſe C, make the angle C=56° 30′; then take CB=84, and with the length of 156=AB taken in your compaſſes from the ſame ſcale of equal parts, fixing one point in B, with the other croſs AC in A. Laſtly, join A and B; ſo the triangle is conſtructed, and the required angle A may be meaſured by a line of chords.

2. *By calculation*: We have, by theor. 1. the following proportion for finding the angle A, *viz.*

AB : BC :: S, C : S, A.

i. e. as AB	156	2.19312
To BC	84	1.92428
So is S, C	56° 30′	9.92111
To S, A	26° 41′	9.65227

CASE II. The angles, and a ſide oppoſite to one of them, being given, to find a ſide oppoſite to another.

EXAMPLE. In the triangle HBG (*ibid.* n° 5.) ſuppoſe the angle H 46° 15′, and the angle B 54° 22′, conſequently the angle G 79° 23′, and the leg HB 125, required HG,

Geometrically: Draw HB 125, from any line of equal parts, and make the angle H 46° 15′, and B 54° 22′, then produce the lines HG and BG till they meet one another in the point G: ſo the triangle is conſtructed, and HG is meaſured by taking its length in your compaſſes, and applying it to the ſame line of equal parts that HB was taken taken from.

2. *By calculation*: By the firſt of the preceding theorems, we have this analogy for finding HG, *viz.*

S, G : HB :: S, B : HG.

i. e. As the fine of G	79° 23′	9 99250
is to the leg HB	125	2.09691
ſo is the fine of B	54° 22′	9.90996
to the leg HG	103.4	2.01437

CASE III. Two ſides and an angle oppoſite to one of them given, to find the third ſide.

EXAMPLE. In the triangle KLM (*ibid.* n° 6.) ſuppoſe the ſide CL 126 equal parts, and KM 130 of theſe parts, and the angle L (oppoſite to KM) 63° 20′, required the ſide ML.

1. *Geometrically*: The conſtruction of this caſe is the ſame with that in Caſe I. (there being the ſame things given in both,) and the leg ML may be meaſured by applying it to the ſame line of equal parts that the other two were taken from.

2. *By calculation*: The ſolution of this caſe depends upon the two preceding ones; and, firſt, we muſt find the other two angles by Caſe I. thus:

MK : S, L :: KL : S, M.

i. e. As the ſide MK	130	2.11394
To the fine of L	63° 20′	9.95116
So is the ſide KL	126	2.10037
To the fine of M	60° 1′	9.93759

Then by Caſe II. we have the required leg ML, thus:

S. L : S. K :: MK : ML.

i. e. As the fine of L	63° 20′	9.95116
To the fine of K	53° 39′	9.90602
So is KM	130	2.11394
To ML	117.2	2.06850

CASE IV. Two ſides and the contained angle being given, to find the other two angles.

EXAMPLE: In the triangle ACD (*ibid.* n° 7.) ſuppoſe AC=103, AD=126, and the angle A=54° 30′; required the angles C and D.

1. *Geometrically*: Draw AD=126, and make the angle A=54° 30′; then ſet off 103 equal parts from A to C: laſtly, join C and D; and ſo the triangle is conſtructed, and the angles C and D may be meaſured by a line of chords.

2. *By calculation*: The ſolution of this caſe depends upon the ſecond and third of the preceding theorems; and firſt we muſt find the ſum and difference of the ſides, and half the ſum of the unknown angles, thus:

The leg AD is	126
The leg AC is	103
Their ſum is	229
And their difference is	23
The ſum of the three angles A, D, and C, is	180°
The angle A is	54° 30
So the ſum of the angles C and D will be	125° 30′
And half their ſum is	62° 45′

Then by theor. 2. we have the following proportion, *viz.*

As the ſum of the ſides AD and AC=229		2.35984
To their difference	23	1.36173
So is the tangent of half the ſum of the unknown angles C and D	62° 45′	10.28816
To tang. of half their difference	11° 2′	9.29005

Now having half the ſum and half the difference of the two unknown angles C and D, we find the quantity of each of them by theorem 3. thus:

To half the ſum of the angles C and D, *viz.*	62° 45′
Add half their difference, *viz.*	11° 02′
And the ſum is the greater angle C	73° 47′
Again from half their ſum, *viz.*	62° 45′
Take half their difference, *viz.*	11° 02
And there will remain the leſſer angle D	=51° 43′

N. B. The greater angle is always that ſubtended by the greater ſide: thus, in the preſent caſe, the greater angle C, is ſubtended by the greater ſide AD; and the leſſer angle D is ſubtended by the leſſer ſide AC.

CASE V. Two ſides and the contained angle being given, to find the third ſide.

EXAMPLE. In the triangle BCD (*ibid.* n° 8.) ſuppoſe BC=154, BD=133, and the angle B=56° 03′; required the ſide CD.

1. *Geometrically*: The conſtruction of this caſe is the ſame with that of the laſt, and the length of DC is found by taking its length in your compaſſes, and applying it to the ſame line of equal parts that the two legs were taken from.

2. *By calculation*: The ſolution of this caſe depends upon the ſecond and fourth; and firſt we muſt find the angles by the laſt caſe; thus:

As the ſum of the ſides BD and BC 287 2.45788

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Is to their difference 21		1.32222
So is the tangent of half the sum of the angles D and C	61° 58'	10.27372
To the tangent of half their difference	7° 50'	9.13806

So by theorem 3. we have the angles D and C thus:

To half the sum of the angles D and C	61° 58'
Add half their difference	7° 50'
And the sum is the greater angle D	69° 48'
Also, from half the sum	61° 58'
Take half the difference	7° 50'
And there remains the lesser angle C	54° 08'

Then by Case II. we have the following analogy for finding DC the leg required, *viz.*

S, C : B D : : S, B : D C.

i. e. As the sine of C	54° 08'	9.90869
To BD	133	2.12385
So is the sine of B	56° 03'	9.91883
To D C	136.2	2.13399

Case VI. Three sides being given, to find the angles.

Example: In the triangle A B C (*ibid.* n° 9.) suppose AB=156, AC=185.7, and BC=84; required the angles A, B, and C.

I. *Geometrically:* Make AC=185.7 from any line of equal parts; and from the same line taking 156=AB in your compasses, fix one foot of them in A, and with another sweep an arch; then take 84=BC in your compasses, and fixing one foot in C, with the other sweep an arch, which will cross the former in B: lastly, join the points B and A, and B and C; so the triangle will be constructed, and the angles may be measured by a line of chords.

II. *By calculation:* Let fall the perpendicular, B D, from the vertex B, upon the base AC; which will divide the base into two segments AD and DC, the lengths whereof may be found by theorem 4. thus:

As the base AC	185 7	2 26893
To the sum of the sides AB and BC	240	2.38031
So is the difference of the sides	72	1.85733
To the diff. of the segments of the base	93	1.96871

And having the sum of the segments, *viz.* the whole base, and their difference, we find the segments themselves, by theorem 3. thus:

To half the sum of the segments	92.8
And half their difference	46.5
And the sum is the greater segment AD	139.3
Also from half the sum of the segment	92.8
Take half their difference	46.5
The remainder is the lesser segment DC	46.3

Now the triangle ABC is divided, by the perpendicular DB, into two right-angled triangles, ADB and DBC; in the first of which are given the hypothenuse AB=156, and the base AD=139.3, to find the oblique angles, for which we have (by Case V. of rectangular trigonometry) the following analogy, *viz.*

As AB	156	2.19312
To AD	139 3	2.14395
So is the radius	90°	10.00000
To the co-sine of the angle A	26° 40'	9.95083

Also the angle C is found by the same case, thus:

As BC	84	1.92428
To CD	46.3	1.66558
So is the radius	90°	10.00000
To the co-sine of C	56° 30'	9.74130

Having found the two angles A and C, we have the third, B, by taking the sum of the other two from 180, thus:

The sum of all the three angles is	180°
The sum of A and C is	83° 10'
The angle B is	96° 50'

All the proportions used for the solutions of the several cases in plain trigonometry, may be performed by the scale and compass. On the scale there are several logarithmic lines, *viz.* one of numbers, another of sines, and one of tangents, *&c.*

And the way of working a proportion by these is this, *viz.* extend your compasses from the first term of your proportion, found on the scale, to the second; and with that extent, fixing one foot in the third term, the other will reach the fourth term required.

SPHERICAL TRIGONOMETRY.

Spherical Trigonometry is the art whereby, from three given parts of a spherical triangle, we discover the rest; and, like plane trigonometry, is either right-angled, or oblique-angled. But before we give the analogies for the solution of the several cases in either, it will be proper to premise the following theorems.

Theorem I. In all right-angled spherical triangles, the sine of the hypothenuse: radius:: sine of a leg: sine of its opposite angle. And the sine of a leg: radius:: tangent of the other leg: tangent of its opposite angle.

Demonstration. Let E D A F G (*ibid.* fig. 3.) represent the eighth part of a sphere, where the quadrantal planes EDFG, EDBC, are both perpendicular to the quadrantal plane ADFB; and the quadrantal plane ADGC is perpendicular to the plane EDFG; and the spherical triangle ABC is right-angled at B, where CA is the hypothenuse, and BA, BC, are the legs.

To the arches G F, C B, draw the tangents H F, O B, and the sines GM CI on the radii DF DB; also draw BL the sine of the arch AB, and CK the sine of AC; and then join IK and OL. Now HF, OB, GM, CI, are all perpendicular to the plane ADFB. And HD, GK, OL, lie all in the same plane ADGC. Also FD, IK, BL, lie all in the same plane ADGC. Therefore, the right-angled triangles HFD, CIK, ODL, having the equal angles HDF, CKI, OLB, are similar. And CK : DG :: CI : GM; that is, as the sine of the hypothenuse: rad. :: sine of a leg: sine of its opposite angle. For GM is the sine of the arc GF, which measures the angle CAB. Also, LB : DF:: BO : FH; that is, as the sine of a leg: radius :: tangent of the other leg : tangent of its opposite angle, Q. E. D.

Hence it follows, that the sines of the angles of any oblique spherical triangle ACD (*ibid.* n° 2.) are to one another, directly, as the sines of the opposite sides. Hence it also follows, that, in right-angled spherical triangles, having the same perpendicular, the sines of the bases will be to each other, inversely, as the tangents of the angles at the bases.

Theorem,

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THEOREM II. In any right-angled ſpherical triangle ABC (*ibid.* n° 3.) it will be, As radius is to the co-ſine of one leg, ſo is the co-ſine of the other leg to the co-ſine of the hypothenuſe.

Hence, if two right-angled ſpherical triangles ABC, CBD (*ibid.* n° 2.) have the ſame perpendicular BC, the co-ſines of their hypothenuſes will be to each other, directly, as the co-ſines of their baſes.

THEOREM III. In any ſpherical triangle it will be, As radius is to the ſine of either angle, ſo is the co-ſine of the adjacent leg to the co-ſine of the oppoſite angle.

Hence, in right-angled ſpherical triangles, having the ſame perpendicular, the co-ſines of the angles at the baſe will be to each other, directly, as the ſines of the vertical angles.

THEOREM IV. In any right-angled ſpherical triangle it will be, As radius is to the co-ſine of the hypothenuſe, ſo is the tangent of either angle to the co-tangent of the other angle.

As the ſum of the ſines of two unequal arches is to their difference, ſo is the tangent of half the ſum of thoſe arches to the tangent of half their difference: and, as the ſum of the co-ſines is to their difference, ſo is the co-tangent of half the ſum of the arches to the tangent of half the difference of the ſame arches.

THEOREM V. In any ſpherical triangle ABC (*ibid.* n° 4. and 5.) It will be, as the co-tangent of half the ſum of half their difference, ſo is the co-tangent of half the baſe to the tangent of the diſtance (DE) of the perpendicular from the middle of the baſe.

Since the laſt proportion, by permutation, becomes co-tang. $\frac{AC+BC}{2}$: co-tang. AE : : tang. $\frac{AC-BC}{2}$: tang. DE, and as the tangents of any two arches are, inverſely, as their co-tangents; it follows, therefore, that tang. AE: tang. $\frac{AC+BC}{2}$: : tang. $\frac{AC-BC}{2}$: tang. DE; or, that the tangent of half the baſe is to the tangent of half the ſum of the ſides, as the tangent of half the difference of the ſides to the tangent of the diſtance of the perpendicular from the middle of the baſe.

THEOREM VI. In any ſpherical triangle ABC (*ibid.* n° 4.) it will be, as the co-tangent of half the ſum of the angles at the baſe, is to the tangent of half their difference, ſo is the tangent of half the vertical angle to the tangent of the angle which the perpendicular CD makes with the line CF biſecting the vertical angle.

The Solution of the Caſes of right-angled ſpherical Triangles, (*ibid.* n° 3.)

Caſe	Given	Sought	Solution
1	The hyp. AC and one angle A	The oppoſite leg BC	As radius : ſine hyp. AC :: ſine A : ſine BC (by the former part of theor. 1.)
2	The hyp AC and one angle A	The adjacent leg AB	As radius : co-ſine of A : : tang. AC. tang. AB by the latter part of theo. 1.
3	The hyp. AC and one angle A	The other angle C	As radius : co-ſine of AC :: tang. A : co-tang. C (by theorem 4.)
4	The hyp. AC and one leg AB	The other leg BC	As co-ſine AB : radius :: co-ſine AC : co-ſine BC (by theorem 2.)
5	The hyp. AC and one leg AB	The oppoſite angle C	As ſine AC : radius :: ſine AB : ſine C (by the former part of theorem 1.)
6	The hyp. AC and one leg AB	The adjacent angle A	As tang. AC : tang. AB :: radius : co-ſine A (by theorem 1.)
7	One leg AB and the adjacent angle A	The other leg BC	As radius : ſine AB :: tangent A : tangent BC (by theorem 4.)
8	One leg AB and the adjacent angle A	The oppoſite angle C	As radius : ſine A :: co-ſine of AB : co-ſine of C (by theorem 3.)
9	One leg AB and the adjacent angle A	The hyp. AC	As co-ſine of A : radius :: tang. AB : tang. AC (by theorem 1.)
10	One leg BC and the oppoſite angle A	The other leg AB	As tang. A : tang. BC :: radius : ſine AB (by theorem 4.)
11	One leg BC and the oppoſite angle A	The adjacent angle C	As co-ſine BC : radius :: co-ſine of A : ſin. C (by theorem 3.)
12	One leg BC and the oppoſite angle A	The hyp. AC	As ſin. A : ſin. BC :: radius : ſin. AC (by theorenm 1.)
13	Both legs AB and BC	The hyp. AC	As radius : co-ſine AB :: co-ſine BC : co-ſine AC (by theorem 2.)
14	Both legs AB and BC	An angle, ſuppoſe A	As ſine AB : radius :: tang. BC : tang. A (by theorem 4.)
15	Both angles A and C	A leg, ſuppoſe AB	As ſine A : co-ſine C :: radius : co-ſine AB (by theorem 3.)
16	Both angles A and C	The hyp. AC	As tan A : co-tang. C : : radius : co-ſine AC (by theorem 4.)

Note, The 10th, 11th, and 12th caſes are ambiguous; ſince it cannot be determined by the data, whether A, B, C, and AC, be greater or leſs than 90 degrees each.

The

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The Solution of the Cases of oblique spherical Triangles, (*ibid.* n° 4. and 5.)

Case	Given	Sought	Solution
1	Two sides AC, BC, and an angle A opposite to one of them.	The angle B opposite to the other	As sine BC : sine A :: sine AC : sine B (by theor. 1.) Note, this case is ambiguous when BC is less than AC; since it cannot be determined from the data whether B be acute or obtuse.
2	Two sides AC, BC, and an angle A opposite to one of them.	The included angle ACB	Upon AB produced (if need be) let fall the perpendicular CD : then (by theor. 4.) rad. : co-sine AC :: tang. A : co-tang. ACD; but (by theor. 1.) as tang. BC : tang. AC :: co-sine ACD : co-sine BCD. Whence ACB=ACD±BCD is known.
3	Two sides AC, BC, and an angle opposite to one of them	The other side AB	As rad. : co-sine A :: tang. AC : tang. AD (by theor. 1.) and (by theor. 2.) as co-sine AC : co-sine BC :: co-sine AD : co-sine BD. Note, this and the last case are both ambiguous when the first is so.
4	Two sides AC, AB, and the included angle A	The other side BC	As rad. : co-sine A :: tang. AC : tan. AB (by theor. 1.) whence AD is also known : then (by theor. 2.) as co-sine AD : co-sine BD :: co-sine AC : co-sine BC.
5	Two sides AC AB, and the included angle A	Either of the other angles, suppose B	As rad. : co-sine A :: tang. AC : tan. AD (by theorem 1.) whence BD is known : then (by theor. 4.) is sine BD: sine AD :: tan. A : tan. B.
6	Two angles A, ACB, and the side AC betwixt them	The other angle B	As rad. : co-sine AB :: tang. A : co-tang. ACD (by theor. 4.) whence BCD is also known : then (by theor. 3.) as sine ACD : sine BCD :: co-sine A : co-sine B.
7	Two angles A, ACB, and the side AC betwixt them	Either of the other sides suppose BC	As rad. : co-sine AC :: tang. A : co-tang. ACD (by theo. 4) whence BCD is also known : then, as co-sine BCD: co-sine ACD :: tang. AC : tang. BC (by theor. 1)
8	Two angles A, B, and a side AC opposite to one of them	The side BC opposite the other	As sine B : sine AC :: sine A : sine BC (by theorem 1.)
9	Two angles A, B, and a side AC opposite to one of them	The side AB betwixt them	As rad. : co-sine A :: tang. AC : tan. AD (by theor. 1) and as : tang B : tang. A :: sine AD : sine BD (by theor. 4.) whence AB is also known.
10	Two angles A, B, and a side AC opposite to one of them	The other angle ACB	As rad. : co-sine AC :: tang. A : co-tang. ACD (by theor. 4.) and as co-sine A : co-sine B :: sine ACD : sine BCD (by theor. 3.) whence ACB is also known.

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Caſe	Given	Sought	Solution
11	All the three ſides AB, AC, and BC	An angle, ſuppoſe A	As tang. ½ AB : tang. $\frac{AC+BC}{2}$ :: tang. $\frac{AC-BC}{2}$: tang. DE, the diſtance of the perpendicular from the middle of the baſe (by theor. 6.) whence AD is known: then, as tang. AC : tang. AD :: rad. : co-ſine A (by theorem 1.)
12	All the three angles A, B, and ACB	A ſide, ſuppoſe AC	As co-tan. $\frac{ABC+A}{2}$: tan. $\frac{ABC-A}{2}$ :: tang. $\frac{ACB}{2}$: tang. of the angle included by the perpendicular and a line biſecting the vertical angles; whence ACD is alſo known: then (by theor. 5.) tang. A : co-tang. ACD :: rad. co-ſine AC.

TRINGA, in ornithology, a genus of birds belonging to the order of graſſæ. The beak is ſomewhat cylindrical, and as long as the head; the noſtrils are linear; and there are four toes on the feet, the hind one conſiſting of one joint, and elevated above the ground. There are 23 ſpecies, principally diſtinguiſhed by their colour.

TRINGLE, in architecture, a name common to ſeveral little ſquare members or ornaments, as reglets, liſtels, and plat-bands. It is more particularly uſed for a little member fixed exactly over every triglyph, under the plat-band of the architrave, from whence the guttæ or pendant drops hang down.

TRINIDAD, or TRINITY-ISLAND, is ſituated in the Atlantic or American ocean, between 60° and 62° of weſt longitude, and between 9° and 11° of north latitude; it is about ninety miles long, and ſixty broad.

TRINIDAD, a port-town of Mexico, in America, ſituated in the province of Guatimala, an hundred and twenty miles ſouth-eaſt of the city of Guatimala: W. long. 94°, N. lat. 13°.

TRINITARIANS, thoſe who believe in the Trinity; thoſe who do not believe therein, being called antitrinitarians.

Trinitarians alſo denote an order of religious inſtituted at Rome in the year 1198, under the pontificate of Innocent III. the founders whereof were John de Matha, and Felix de Valois. His holineſs gave them permiſſion to eſtabliſh this order for the deliverance of captives, who groaned under the tyranny of the infidels: he gave them, as a habit, a white gown ornamented with a red and blue croſs. After the death of the two founders, pope Honorious III. continued the order, and their rule was approved by his ſucceſſor Clement IV. in 1267. At firſt they were not permitted to eat fleſh, and, when they travelled, were to ride only upon aſſes. But their rule was corrected and mitigated by the biſhop of Paris, and the abbots of St. Victor and St. Genevieve, who allowed them to eat any kind of food, and to uſe horſes. This order poſſeſſes about two hundred and fifty convents in thirteen different provinces: ſix of which are in France; namely, France, Normandy, Picardy, Champaine, Languedoc, and Provence; three in Spain, *viz.* New Caſtile, Old Caſtile, and Arragon; one is in Italy, and one in Portugal. There was formerly the province of England, where this order had forty-three houſes; that of Scotland, where it had nine; and that of Ireland, where it had fifty-two; beſides a great number of monaſteries in Saxony, Hungary, Bohemia, and other countries. The convent of Cerfroy in France is head of the order.

TRINITY, in theology, the ineffable myſtery of three perſons in one God; Father, Son, and Holy Spirit.

TRINITY SUNDAY, a feſtival obſerved on the Sunday next after Whitſunday, in honour of the holy Trinity. The obſervation of this feſtival was firſt enjoined in the council of Arles, *anno* 1260.

Fraternity of the TRINITY, a religious ſociety inſtituted at Rome by St. Philip Neri, in 1548. Theſe religious were appointed to take care of the pilgrims who came to viſit the tombs of St. Peter and St. Paul. The ſociety originally conſiſted of only fifteen religious, who aſſembled on the firſt Sunday of every month, in the church of St. Saviour del Campo, to hear the exhortations of the founder; after whoſe death pope Paul IV. gave the fraternity the church of St. Benedict, near which they have ſince built a large hoſpital, for the reception of pilgrims. The fraternity is one of the moſt conſiderable in Rome, and moſt of the nobility of both ſexes have been members thereof.

TRIO, in muſick, a part of a concert wherein three perſons ſing; or more properly a muſical compoſition conſiſting of three parts.

TRIONES, in aſtronomy, a ſort of conſtellation or aſſemblage of ſeveral ſtars in the urſa minor, commonly called Charles's wain.

TRIOPTERIS, in botany, a genus of the decandria trigynia

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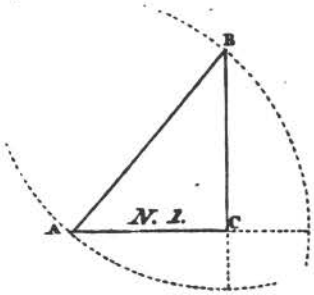
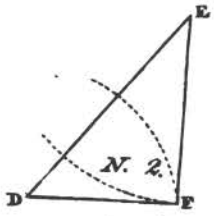
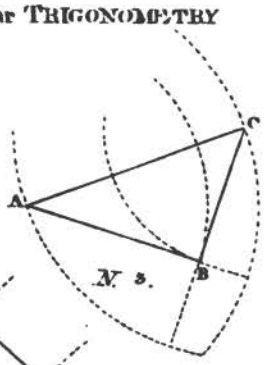
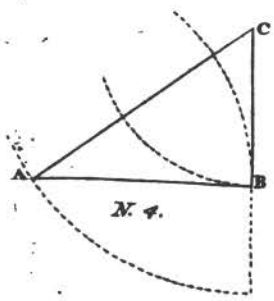
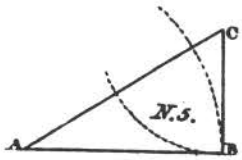
Fig. 1. Rectangular TRIGONOMETRY

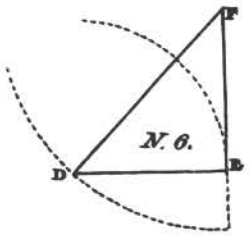


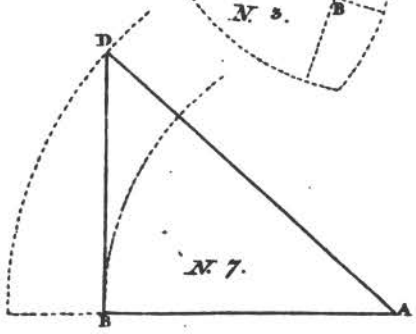












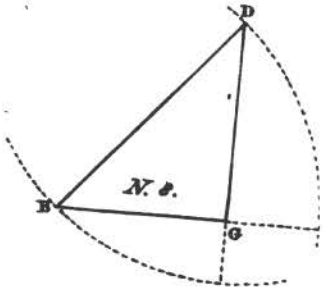
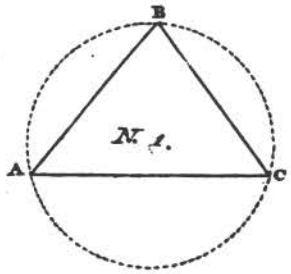
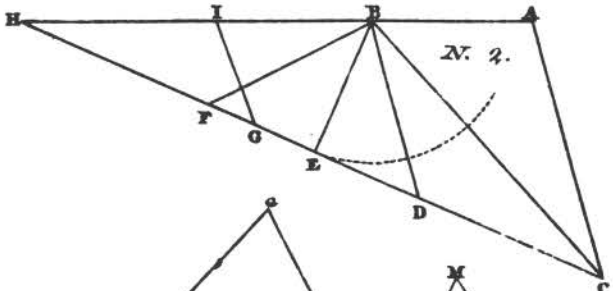
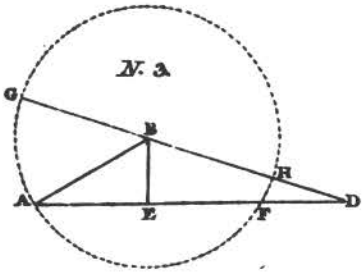
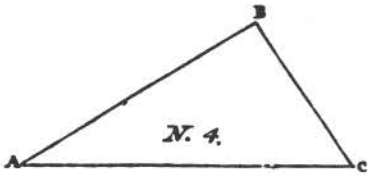


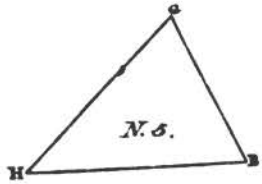
Fig. 2. Oblique angled TRIGONOMETRY

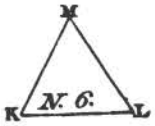


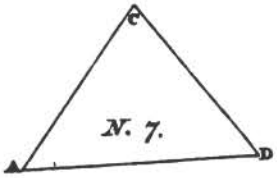


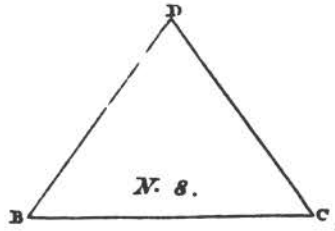












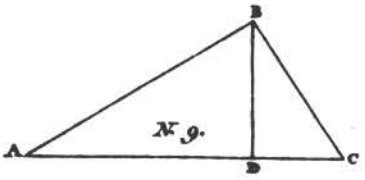
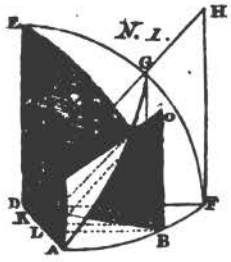
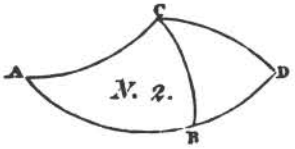
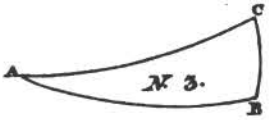
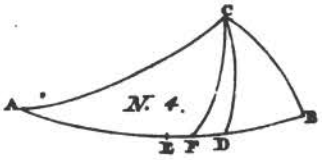


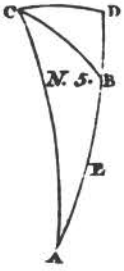
Fig. 3. Spherical TRIGONOMETRY











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gynia claſs. The calix conſiſts of ſix ſegments; and there are three ſeeds, with a double membranous wing. There is but one ſpecies, a native of Jamaica.

TRIP, a ſea-term. A ſhip is ſaid to bear her top-ſails a-trip, when ſhe carries them hoiſted up to the higheſt.

TRIPARTITE, ſomething divided into three parts, or made by three parties, as indenture tripartite, *&c.*

TRIPARTITION, a diviſion by three, or the taking the third part of any number or quantity.

TRIPHTHONG, in grammar, an aſſemblage or concourſe of three vowels in the ſame ſyllable, as *quæ*.

TRIPLE, in muſick, is one of the ſpecies of meaſure or time. See MUSICK.

TRIPOD, in antiquity, a famed ſacred ſeat or ſtool, ſupported by three feet, whereon the prieſts and ſibyls were placed to render oracles. It was on the tripod that the gods were ſaid to inſpire the Pythians with that divine fury and enthuſiaſm wherewith they were ſeized at the delivery of their predictions.

TRIPOLI, a ſtate of Africa, which including Barca, is bounded by the Mediterranean-ſea on the north, by Egypt on the eaſt, by Nubia and Bildulgerid on the ſouth, and by Tunis on the weſt; extending along the ſhore of the Mediterranean from the north-weſt to the ſouth-eaſt about a thouſand miles, but ſcarce two hundred miles broad in any place. The city of Tripoli, being the capital of this ſtate, is ſurrounded with a wall and other fortifications: E. long. 14° 30′, N. lat. 33° 30′.

TRIQUETROUS, among botaniſts, expreſſes a fruit or leaf that has three ſides or faces all flat.

TRIREMIS, in antiquity, a galley with three ranks of oars on a ſide.

TRISMEGISTUS, an epithet or ſurname given to one of the two Hermeſes, or Mercuries, kings of Thebes in Egypt, who is ſaid to be contemporary with Moſes.

TRISPASTON, in mechanics, a machine with three pullies, or an aſſemblage of three pullies for raiſing of great weights.

TRISYLLABLE, in grammar, a word conſiſting of three ſyllables.

TRITICUM, in botany, a genus of the triandria digynia claſs. The calix conſiſts of two ſeſſile valves, containing three flowers. There are eleven ſpecies, only three of them natives of Britain, *viz.* the repens, or couch-graſs; the caninum, or bearded wheat-graſs; and the junceum, or ſea wheat-graſs. For the culture of wheat, ſee AGRICULTURE, p. 60.

TRITON, in zoology, a genus belonging to the order of vermes molluſca. The body is oblong; the tongue is ſpiral; it has 12 tentacula, ſix on each ſide, the hindmoſt ones having claws like a crab. There is but one ſpecies, found in holes of rocks about the ſea-ſhore.

TRITON, a ſea demi-god, held by the ancients to be an officer or trumpeter of Neptune, attending on him, and carrying his orders and commands from ſea to ſea.

TRITURATION, the act of reducing a ſolid body into a ſubtile powder; called alſo levigation and pulverization.

TRIUMFETTA, in botany, a genus of the dodecandria monogynia claſs. The corolla conſiſts of five petals, and the calix of five leaves; and the capſule is hairy, and opens in four parts. There are two ſpecies, both natives of India.

TRIUMPH, in Roman antiquity, a public and ſolemn honour conferred by the Romans on a victorious general, by allowing him a magnificent entry into the city.

The greater triumph, called alſo curulis, or ſimply the triumph, was decreed by the ſenate to a general, upon the conquering of a province, or gaining a ſignal victory. The day appointed for the ceremony being arrived, ſcaffolds were erected in the forum and circus, and all the other parts of the city, where they could beſt behold the pomp: the ſenate went to meet the conqueror without the gate called Capena or Triumphalis, and marched back in order to the capitol; the ways being cleared and cleanſed by a number of officers and tipſtaffs, who drove away ſuch as thronged the paſſage, or ſtraggled up and down. The general was clad in a rich purple robe, interwoven with figures of gold, ſetting forth his great exploits; his buſkins were beſet with pearl; and he wore a crown, which at firſt was only laurel, but afterwards gold; in one hand he bore a branch of laurel, and in the other a truncheon. He was drawn in a magnificent chariot, adorned with ivory and plates of gold, drawn uſually by two white horſes; though ſometimes by other animals, as that of Pompey, when he triumphed over Africa, by elephants; that of Marc Antony, by lions; that of Heliogabalus, by tygers; that of Aurelian, by deer, *&c.* His children were at his feet, and ſometimes on the chariot-horſes. The proceſſion was led up by the muſicians, who played triumphal pieces, in praiſe of the general: theſe were followed by young men, who led the victims to the ſacrifice, with their horns gilded, and their heads adorned with ribbands and garlands; next came the carts and waggons, loaded with all the ſpoils taken from the enemy, with their horſes, chariots, *&c.* theſe were followed by the kings, princes, and generals, who had been taken captives, loaden with chains: after theſe appeared the triumphal chariot, before which, as it paſſed, they all along ſtrewed flowers, and the people, with loud acclamations, called out *Io triumphe!* The chariot was followed by the ſenate, clad in white robes; and the ſenate by ſuch citizens as had been ſet at liberty or ranſomed: and the proceſſion was cloſed by the prieſts and their officers and utenſils, with a white ox led along, for the chief victim. In this order they proceeded through the triumphal gate, along the via ſacra, to the capitol, where the victims were ſlain. In the mean time all the temples were open, and all the altars loaded with offerings and incenſe; games and combats were celebrated in the public places, and rejoicings appeared every where.

TRIUMVIR, one of three perſons who govern abſolutely, and with equal authority, in a ſtate. It is chiefly applied to the Roman government: Cæſar, Pompey, and Craſſus were the firſt triumvirs, who divided the government amongſt them. There were alſo other officers, called triumvirs; as the triumviri or treſviri capitales, who were the keepers of the public goal: they had the office of puniſhing malefactors; for which purpoſe they kept eight lictors under them.

TRIUMVIRATE, an abſolute government, adminiſtered by three perſons with equal authority. See the preceding article.

TROCHANTER, in anatomy. See ANATOMY, p. 182.

TROCHE, in pharmacy, a ſort of medicine, made of glutinous ſubſtances, into little cakes, and afterwards exſiccated.

TROCHÆUS,

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TROCHÆUS, in the Greek and Latin poetry, a foot conſiſting of two ſyllables, the firſt long, and the ſecond ſhort.

TROCHILUS, in ornithology, a genus belonging to the order of picæ. The beak is ſubulated and thread-ſhaped, with a tubular apex, and longer than the head, the ſuperior mandible ſheathing the inferior; the tongue is thread-ſhaped; and the feet are fitted for walking. This genus comprehends all the humming birds, which are the ſmalleſt of birds, and are diſtinguiſhed by their colour and the ſhape of their bills.

TROCHLEA, one of the mechanical powers, uſually called a pulley. See MECHANICS.

TROCHLEARES, in anatomy. See ANATOMY, p. 290.

TROGLODYTES, in the ancient geography, a people of Æthiopia, ſaid to have lived in caves under ground. Pom. Mela gives a ſtrange account of the Troglodytes: he ſays, they did not ſo properly ſpeak as ſhriek, and that they lived on ſerpents.

TROJA, or TROJAN GAMES, were games ſaid to be inſtituted by Aſcanius, ſon of Æneas, and afterwards kept up by the Romans with great ſolemnity. They were celebrated by companies of boys, neatly dreſſed, and furniſhed with little arms and weapons, who muſtered in the public circus. They were choſen, for the moſt part, out of the nobleſt families of Rome, and the captain of them had the honourable title of princeps juventutis, being ſometimes next heir to the empire, and ſeldom leſs than the ſon of a principal ſenator.

TROIS RIVIERES, a town of North America, in the province of Canada, ſituated on the river of St. Laurence, fifty miles ſouth of Quebec: W. long. 75°, and N. lat. 46° 45′.

TRONAGE, an ancient cuſtomary toll, paid for weighing of wool. This word is particularly mentioned in a charter granted to the mayor and citizens of London; in which city there is an officer called tronator, whoſe buſineſs it is to weigh the wool that is brought thither.

TRONCONNEE, in heraldry, denotes a croſs, or other thing, cut in pieces and diſmembered, yet ſo as all the pieces keep up the form of a croſs, though ſet at a ſmall diſtance from one another.

TROOP, a ſmall body of horſe or dragoons, about fifty or ſixty, ſometimes more, ſometimes leſs; commanded by a captain. Each troop, beſides a captain, has a lieutenant, cornet, quarter-maſter, and three corporals, who are the loweſt officers of a troop.

TROPÆOLUM, in botany, a genus of the octandria monogynia claſs. The calix conſiſts of one calcarated leaf; and the corolla of five unequal petals; and there are three dry berries. The ſpecies are three, all natives of Peru.

TROPE, in rhetoric, a kind of figure of ſpeech, whereby a word is removed from its firſt and natural ſignification, and applied with advantage to another thing, which it does not originally mean; but only ſtands for it, as it has a relation to, or connection with it: as in this ſentence, *God is my rock*. Here the trope lies in the word *rock*, which being firm and immoveable, excites in our minds the notion of God's unfailing power, and the ſteady ſupport which good men receive from their dependence upon him.

TROPHY, among the ancients, a pile or heap of arms of a vanquiſhed enemy, raiſed by the conqueror in the moſt eminent part of the field of battle.

TROPICS, in aſtronomy. See ASTRONOMY, p. 469.

TROUT, in ichthyology. See SALMO.

TRUFFLES. See LYCOPERDON.

TRUMPET, a muſical inſtrument, the moſt noble of all portable ones of the wind kind, uſed chiefly in war among the cavalry, to direct them in the ſervice.

TRUNCATED, in general, is an appellation given to ſuch things as have, or ſeem to have, their points cut off: thus we ſay, a truncated cone, pyramid, leaf, *&c.*

TRUNCHEON, a ſhort ſtaff, or battoon, uſed by kings, generals, and great officers, as a mark of their command.

TRUNDLE, a ſort of carriage with low wheels, whereon heavy and cumberſome burdens are drawn.

TRUNK, among botaniſts, denotes the ſtem, or body, of a tree; or, that part between the ground and the place where it divides into branches.

TRUNNIONS, or TRUNIONS *of a piece of ordnance*, are thoſe knobs or bunches of the gun's metal, which bear her up on the cheeks of the carriage.

TRUSS, a bundle, or certain quantity of hay, ſtraw, *&c.*

A truſs of hay is to contain fifty-ſix pounds, or half an hundred weight; thirty-ſix truſſes make a load.

TRUSS is alſo uſed for a ſort of bandage or ligature, made of ſteel, or the like matter, wherewith to keep up the parts in thoſe who have hernias or ruptures.

TRUSTEE, one who has an eſtate, or money, put or truſted in his hands for the uſe of another.

TRUTH, a term uſed in oppoſition to falſhood, and applied to propoſitions which anſwer, or accord, to the nature and reality of the thing whereof ſomething is affirmed or denied.

TUB, in commerce, denotes an indeterminate quantity or meaſure: thus, a tub of tea contains about ſixty pounds; and a tub of camphor from fifty-ſix to eighty pounds.

TUBE, in general, pipe, conduit, or canal; a cylinder hollow within-ſide, either of lead, iron, wood, glaſs, or other matter, for the air, or ſome other fluid, to have a free paſſage or conveyance through.

TUBERCLE, in botany, a kind of round turgid root, in form of a knob or turnip.

The plants which produce ſuch roots are hence denominated tuberoſe, or tuberous, plants.

TUBERCLES, among phyſicians, denote little tumours which ſuppurate and diſcharge pus, and are often found in the lungs, eſpecially of conſumptive perſons.

TUBIPORA, a genus of ſubmarine plants, belonging to the cryptogamia claſs, of the hardneſs of coral, and conſiſting of cylindric tubes riſing from a thin cruſt of the ſame ſort of matter with themſelves.

TUBULI LACTIFERI, in anatomy. See ANATOMY, p. 277.

TUCUMAN, the ſouth-weſt diviſion of the province of La Plata, or Paraguay, in South America.

TULIPA, in botany, a genus of the hexandria monogynia claſs. The corolla is bell-ſhaped, and conſiſts of ſix petals; it has no ſtylus. There are three ſpecies, none of them natives of Britain.

TUMEFACTION, the act of ſwelling or riſing into a tumour.

TUMOUR, in medicine and ſurgery, a preternatural riſing

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rising or eminence on any part of the body. See SURGERY, p. 663.

TUN, a large veſſel or caſk of an oblong form, biggeſt in the middle, and diminiſhing towards its two ends, girt about with hoops, and uſed for ſtowing ſeveral kinds of merchandize, for convenience of carriage; as brandy, oil, ſugar, ſkins, hats, &c. This word is alſo uſed for certain veſſels of extraordinary bigneſs, ſerving to keep wine in for ſeveral years.

TUN is alſo a certain weight whereby the burden of ſhips, &c. are eſteemed.

TUNBRIDGE, a town of Kent, ſituated thirty-three miles weſt of Canterbury, much reſorted to on account of its excellent waters.

TUNICA, a kind of waiſtcoat, or under garment, in uſe amongſt the Romans. They wore it within doors by itſelf, and abroad under the gown. The common people could not afford the toga, and ſo went in their tunics, whence Horace calls them popellus tunicatus.

TUNICA, in anatomy, is applied to the membranes which inveſt the veſſels, and divers others of the leſs ſolid parts of the body; thus the inteſtines are formed of five tunics, or coats.

TUNIS, the capital of the kingdom of Tunis, thirty miles ſouth of Carthage ruins, 300 miles eaſt of Algiers, and 120 ſouth-weſt of Trapano, in Sicily; a populous city, about three miles in circumference: E. long. 10° N. lat. 36° 20′. The kingdom of Tunis is ſituated on the coaſt of Barbary, in Africa, being bounded by the Mediterranean ſea on the north. It extends 200 miles in length from eaſt to weſt, along the ſhore of the Mediterranean; the breadth is very unequal.

TUNNAGE is uſed for a cuſtom or impoſt, payable to the crown, for goods and merchandize imported or exported, and is to be paid after a certain rate for every tun thereof. This duty, as well as that of poundage, was firſt granted for life to king Charles II. and has been continued in the ſame manner to his royal ſucceſſors, down to his preſent majeſty king George III.

TURBAN, the head-dreſs of moſt of the eaſtern nations. It conſiſts of two parts, a cap, and a ſaſh of fine linen or taffety, artfully wound in divers plaits about the cap. The cap has no brim, is pretty flat, though roundiſh at top, and quilted with cotton, but does not cover the ears. There is a good deal of art in giving the turban a fine air, and the making of them is a particular trade. The ſaſh of the Turks turban is white linen; that of the Perſians red woollen. Theſe are the diſtinguiſhing marks of their different religions. Sophi, king of Perſia, being of the ſect of Ali, was the firſt who aſſumed the laſt colour, to diſtinguiſh himſelf from the Turks, who are of the ſect of Omar, and whom the Perſians eſteem heretics.

TURBINATED, is a term applied by naturaliſts, to ſhells which are ſpiral, or wreathed, conically, from a larger baſis to a kind of apex.

TURBITH, or TURPETH-ROOT, in the materia medica, the cortical part of the root of an Indian convolvulus, brought to us in oblong pieces, of a brown or aſh-colour on the outſide, and whitiſh within: the beſt is ponderous, not wrinkled, eaſy to break, and diſcovering a large quantity of reſinous matter to the eye: its taſte is at firſt ſweetiſh; when chewed for a little time, it becomes acid, pungent, and nauſeous. This root is a cathartic, not of the ſafeſt, or moſt certain kind.

TURBITH-MINERAL. See CHEMISTRY, p. 139.

TURBO, in zoology, a genus of inſects belonging to the order of vermes teſtacea. This is an animal of the ſnail kind; the ſhell conſiſts of one ſpiral ſolid valve; and the aperture is orbicular. There are 49 ſpecies, diſtinguiſhed by peculiarities in their ſhells.

TURBOT, in ichthyology. See PLEURONECTES.

TURCICA TERRA, TURKY-EARTH, in the materia medica, a very fine bole or medicinal earth, dug in great plenty in the neighbourhood of Adrianople, and uſed by the Turks as a ſudorific and aſtringent, and famous among them in peſtilential diſeaſes.

TURCOISE, in natural hiſtory, an ore of copper.

There are, indeed, two kinds of turcois; the one a true and genuine ore of copper; the other the bones of animals tinged to a beautiful blue colour, by having been buried in places where copper-ore has been near them.

TURCOMANIA, a province of Aſiatic Turky, bounded by Perſia on the eaſt, and anſwers to the ancient Armenia; its capital is Erzerum.

TURDUS, in ornithology, a genus belonging to the order of paſſeres. The bill is ſomewhat cylindrical and cultrated; the noſtrils are naked; the faux is ciliated; and the tongue is lacerated. There are 28 ſpecies, principally diſtinguiſhed by their colour.

TURENNE, a town of Guienne, in France: E. long. 1° 20′, and N. lat. 45° 7′.

TURGESCENCE, among phyſicians, denotes a ſwelling, or growing bloated.

TURIN, the capital of Piedmont, in Italy, and of the king of Sardinia's dominions, is ſituated at the confluence of the rivers Po and Doria, 100 miles ſouth-weſt of Milan: E. long. 7° 16′, and N. lat. 44° 50′.

TURIONES, among herbaliſts, denotes the firſt young tender ſhoots which plants annually put forth.

TURKEY, in ornithology. See MELEAGRIS.

TURKY, a very extenſive empire, comprehending ſome of the richeſt countries in Europe, Aſia, and Africa.

Turky in Europe, comprehends Romania, Bulgaria, Servia, Boſnia, Raguſa, Wallachia, Moldavia, Beſſarabia, Budziac, Crim, and little Tartary, with Albania, Epirus, Macedonia, Theſſaly, and all the ancient Greece, with its numerous iſlands. See ROMANIA, &c.

Turky in Aſia, comprehends Natolia, Diarbeck, Syria, Turcomania, and part of Georgia and Arabia.

And Turky in Africa, comprehends the fruitful and extenſive country of Egypt.

TURMERIC, in the materia medica, the root of a plant, called by botaniſts curcuma. See CURCUMA.

TURNEP, in botany, a ſpecies of braſſica. For the culture of them, ſee AGRICULTURE, p. 67.

TURNERA, in botany, a genus of the pentandria trigynia claſs. The calix is funnel-ſhaped, and conſiſts of five ſegments; there are five petals inſerted into the calix; the ſtigmata are divided into many parts; and the capſule has one one cell. There are three ſpecies, none of them natives of Britain.

TURNING, a branch of ſculpture, being the art of faſhioning hard bodies, as braſs, ivory, wood, &c. into a round or oval form, in a lathe.

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TURNSOLE, in botany. See CROTON.

TURPENTINE, a tranſparent ſort of reſin, flowing either naturally or by inciſion from ſeveral unctuous and reſinous trees, as the terebinthus, larch, pine, fir, &c.

The turpentine of Chio or Scio, which is the only genuine kind, and that which gives the denomination to all the reſt, is a whitiſh reſin, bordering a little on green, very clear, and a little odoriferous; drawn by inciſion from a tree called terebinthus, very common in that iſland, as alſo in Cyprus, and ſome parts of France and Spain.

The uſes of turpentine in medicine are innumerable. It is a great vulnerary, and very detergent, and as ſuch is preſcribed in abſceſſes, ulcerations, &c. It promotes expectoration, and as ſuch is preſcribed in diſeaſes of the lungs and breaſt; but it is moſt famous for clearing the urinary paſſages, and as ſuch preſcribed in obſtructions of the reins, in gonorrhœas, &c.

Oil of TURPENTINE. There are two kinds of oil drawn from turpentine, by diſtillation; the firſt white, the ſecond red, both eſteemed as balſams proper for the cure of wounds, chilblains, &c. But they are ſo little uſed among us, that it is not eaſy to procure either of them.

What is commonly ſold under the name of oil of turpentine, or etherial oil, is only a diſtillation of the reſinous juice of the tree, freſh as it is gathered. It is uſed with ſucceſs in the cure of green wounds, as alſo by the painters, farriers, &c. To be good, it muſt be clear and pellucid as water, of a ſtrong penetrating ſmell, and very inflammable.

TURRITIS, in botany, a genus of the tetradynamia ſiliquoſa claſs. The pod is very long, and angular; the calix is connivent and erect; and the corolla is erect. There are two ſpecies, both natives of Britain, *viz.* the glabra, or great tower-muſtard; and the hirſuta, or hairy tower-muſtard.

TURTLE, in ichthyology. See TESTUDO.

TUSCAN ORDER, in architecture. See ARCHITECTURE, p. 351.

TUSCAN EARTH, in the materia medica, a yellowiſh, white, pure bole, conſiderably heavy, of a very ſmooth ſurface, not eaſily breaking between the fingers, but adhering ſlightly to the tongue, and melting very readily in the mouth. It is dug in many parts of Italy, particularly about Florence, where there is a ſtratum of it eight or ten feet thick, at the depth of five or ſix from the ſurface. It is given as a ſudorific, and eſteemed a great medicine in fevers, attended with diarrhœas.

TUSCANY, a duchy of Italy, encompaſſed by the pope's territories on the north-eaſt and ſouth, and bounded by the Tuſcan Sea on the ſouth-weſt, and by the territories of Lucca and Modena on the north-weſt, being 100 miles long, and almoſt as many broad.

TUSSILAGO, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is naked; the pappus is ſimple; the ſcales of the calix are equal, and ſomewhat membranaceous. There are nine ſpecies, three of them natives of Britain, *viz.* the farfara, or common colt's foot; the hybrida, or long-ſtalked butter-bur; and the petaſitas, or common butter-bur.

The common colt's-foot ſtands recommended in coughs and other diſorders of the breaſt and lungs.

TUTOR. See LAW, Tit. vii. 1, &c.

TUTTY, a recrement of mixed metals, in which lapis calaminaris, or zink in its metallic form, is an ingredient, collected in the furnaces where braſs is made from copper and calamine, and where the mixed metals are run. In theſe furnaces they place, under the roof and about the upper parts of the ſides, rods of iron, and ſometimes rolls of dry earth, about which the tutty is afterwards found. Therefore the tutty which we uſe in the ſhops at this time, owes its origin truly and properly to zink, which ſublimes with a very ſmall fire into a kind of flowers, and, when fuſed with any other metal, flies from it in abundance under this form, and alſo frequently takes ſome part of the metal, more or leſs, up with it. Hence it is evident, that the tutty or cadmia of the ancients, muſt have been wholly different from ours, as they uſed no zink nor any of its ores in the furnace where they collected it.

Our tutty then is a hard and heavy ſemimetallic recrement, ſometimes met with in the ſhops in thin flat pieces or flakes, but moſt abundantly in tubular cylindric pieces, reſembling ſegments of the barks of trees puſhed off from the branches without breaking; theſe are of different lengths and diameters. The fineſt tutty is that of a fine deep brown on the outſide, and of a yellowiſh tinge within; the thickeſt, brighteſt, and moſt granulated; the hardeſt to break, and that which has leaſt foulneſs among it.

Tutty is celebrated as an ophthalmic, and frequently employed as ſuch in unguents and collyria.

TUXFORD, a market-town of Nottinghamſhire, twenty miles north-eaſt of Nottingham.

TWEED, a river of Scotland, which riſes on the confines of the ſhire of Clydeſdale, and running eaſtward through Tweedale, and dividing the ſhire of Mers from Tiviotdale and Northumberland, falls into the German ſea at Berwick.

TWEEDALE, a county of Scotland, bounded by Lothian on the north, by Mers and Tiviotdale on the eaſt, by Annandale on the ſouth, and Clydeſdale one the weſt.

TWEER, a city of Ruſſia, capital of the province of Tweer, ſituated on the river Wolgo, ninety miles north of Moſcow, in E. long. 30° 37′, N. lat. 57° 25′.

TWELFTH-DAY, the feſtival of the epiphany, or the manifeſtation of Chriſt to the Gentiles; ſo called, as being the twelfth day, excluſive, from the nativity or Chriſtmas-day.

TWILIGHT, that light, whether in the morning before ſun-riſe, or in the evening after ſun-ſet, ſuppoſed to begin and end when the leaſt ſtars that can be ſeen by the naked eye ceaſe, or begin to appear. By means of the atmoſphere it happens, that though none of the ſun's direct rays can come to us after it is ſet, yet we ſtill enjoy its reflected light for ſome time, and night approaches by degrees. For after the ſun is hid from our eyes, the upper part of our atmoſphere remains for ſome time expoſed to its rays, and from thence the whole is illuminated by reflection.

TWINS, two young ones delivered at a birth, by an animal which ordinarily brings forth but one.

TYGER, or TIGER, in zoology. See LEO.

TYLE, or TILE, in building, a ſort of thin laminated brick, uſed on the roofs of houſes; or more properly a kind

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kind of fat clayey earth, kneaded and moulded, of a juſt thickneſs, dried and burnt in a kiln like brick, and uſed in the covering and paving of houſes.

TYMPAN *of an arch*, is a triangular ſpace or table in the corners or ſides of an arch, uſually hollowed, and enriched ſometimes with branches of laurel, olive-tree, or oak, or with trophies, *&c.* ſometimes with flying figures, as fame, *&c.* or ſitting figures, as the cardinal virtues.

TYMPAN, among printers, a double frame belonging to the preſs, covered with parchment, on which the blank ſheets are laid in order to be printed off. See PRINTING-PRESS.

TYMPANUM, in mechanics, a kind of wheel placed round an axis or cylindrical beam, on the top of which are two levers or fixed ſtaves, for the more eaſy turning the axis, in order to raiſe a weight required. The tympanum is much the ſame with the peritrochium, but that the cylinder of the axis of the peritrochium is much ſhorter, and leſs than the cylinder of the tympanum.

TYMPANUM, in anatomy. See ANATOMY, p. 296.

TYMPANY, in medicine. See MEDICINE, p. 110.

TYPE, a copy, image, or reſemblance of ſome model. The word is much uſed among divines, to ſignify a ſymbol, ſign, or figure of ſomething to come; in which ſenſe it is commonly uſed with relation to antitype, which is the thing itſelf, whereof the other is a type or figure.

TYPE, among letter-founders and printers, the ſame with letter. See LETTER.

TYPE is alſo uſed to denote the order obſerved in the intenſion and remiſſion of fevers, pulſes, *&c.*

TYPHA, in botany, a genus of the monoecia triandria claſs. The amentum of both male and female is cylindrical; the calix of the male conſiſts of three leaves; and neither of them have any corolla. There are two ſpecies, both of them natives of Britain, *viz.* the latifolia, or great cat's-tail; and anguſtifolia, or narrow-leaved cat's-tail.

TYPHODES, in medicine, a kind of ardent or burning fever uſually attending on eryſipelaſes of any of the viſcera.

TYPOGRAPHY, the art of printing. See PRINTING.

TYRANT, among the ancients, denoted ſimply a king or monarch. But the ill uſe ſeveral perſons inveſted with that ſacred character made of it, has altered the import of the word; and tyrant now carries with it the idea of an unjuſt and cruel prince, who invades the peoples liberty, and rules in a more deſpotic manner than the laws of nature or the country do allow of.

TYRE, a port-town of Phœnicia, in Aſiatic Turky, ſituated on the coaſt of the Levant, in E. long. 36°, N. lat. 32° 32′, being anciently the capital of Phœnicia.

TYRONE, an Iriſh county, in the province of Ulſter; bounded by Londonderry, on the north; by Armagh and Laugh-neah, on the eaſt; by Monaghan and Fermanagh, on the ſouth; and by Donnagal on the weſt.

U, V.

VAI VAL

VACCINIUM, in botany, a genus of the octandria monogynia claſs. The calix is above the fruit; the corolla conſiſts of one petal; the filaments are inſerted into the receptacle; and the berry has four cells, containing many ſeeds. There are twelve ſpecies, five of them natives of Britain, *viz.* the myrtillis, or black whortleberries or bilberries; the uliginoſum, or great bilberry-buſh; the cantabricum, or Iriſh whorts; the vitis idea, or red whorts; and the oxycoccus, or craw-berries.

VACUUM, in philoſophy, denotes a ſpace empty or devoid of all matter or body.

VAGINA, properly ſignifies a ſheath, or ſcabbard: and the term vagina is uſed, in architecture, for the part of a terminus, becauſe reſembling a ſheath, out of which the ſtatue ſeems to iſſue.

VAGINA, in anatomy, a large canal, formed of a roboſt or ſtrong membrane, and reaching from the external orifice, or os pudendi, in women, to the uterus See ANATOMY.

VAGUM, or PAR VAGUM. See ANATOMY, 249.

VAIR, in heraldry, a kind of fur, conſiſting of divers little pieces, argent, and azure, reſembling a dutch U, or a bell glaſs. See Plate CXLVII. fig. 21.

VAIRY, in heraldry, expreſſes a coat, or the bearings of a coat, when charged or chequered with vairs: and hence, vairy-cuppy, or vairy-taſſy, is a bearing compoſed of pieces repreſenting the tops of crutches. See Plate CXLVII. fig. 22.

VALAIS, a territory of Switzerland, being a long valley of an hundred miles extent, lying between the head of the river Rhone and the lake of Geneva.

VALANTIA, in botany, a genus of the polygamia monœcia claſs. Neither the hermaphrodite or male have any calix; the corolla of each conſiſts of four ſegments; there are four ſtamina; the ſtylus of the hermaphrodite is biſid, and it has but one ſeed. There are three ſpecies, only one of them, *viz.* the cruciata or croſs-wort, a native of Britain.

VALENCIA, the capital of a province of the ſame name, in Spain, ſituated in a fine plain on the river Guadalaviar: W. long 35′, N lat. 39° 20′.

VALENTINIANS, in church-hiſtory, a ſect of Chriſtian heretics, who ſprung up in the IId century, and were ſo called from their leader Valentinus.

The Valentinians were only a branch of the Gnoſtics, who realized or perſonified the platonic ideas concerning the deity, whom they called Pleroma, or plenitude. Their ſyſtem was this: the firſt principle is Bythos, *i. e.* depth, which remained many ages unknown, having with

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it Ennoe or thought, and Sige or ſilence; from theſe ſprung the Nous, or intelligence, which is the only ſon, equal to, and alone capable of comprehending, the Bythos; the ſiſter of Nous they called Alethia, or truth: and theſe conſtituted the firſt quaternity of æons, which were the ſource and original of all the reſt: for Nous and Alethia produced the world and life; and from theſe two proceeded man and the church. But beſides theſe eight principal œons, there were twenty-two more; the laſt of which, called Sophia, being deſirous to arrive at the knowledge of Bythos, gave herſelf a great deal of uneaſineſs, which created in her Anger and Fear, of which was born Matter. But the Horos, or bounder, ſtopped her, preſerved her in the pleroma, and reſtored her to her perfection. Sophia then produced the Chriſt and the Holy Spirit, which brought the æons to their laſt perfection, and made every one of them contribute their utmoſt to form the Saviour. Here Enthymeſe, or thought, dwelling near the Pleroma, perfected by the Chriſt, produced every thing that is in the world, by its divers paſſions. The Chriſt ſent into it the Saviour, accompanied with angels, who delivered it from its paſſions, without annihilating it: from thence was formed corporeal matter. And in this manner did they romance, concerning God, nature, and the myſteries of the Chriſtian religion.

VALERIANA, in botany, a genus of the triandria monogynia claſs. It has no calix; the corolla conſiſts of one petal, gibbous at the baſe, and ſituate above the fruit. There are 20 ſpecies, three of them natives of Europe, *viz.* the officinalis, or great wild valerian, whoſe root is alexipharmic, ſudorific, and diuretic; the dioica, or marſh valerian; and the locuſta, or lambs-lettuce.

VALET, a French term, uſed as a common name for all domeſtic men ſervants, employed in the more ſervile offices, as grooms, footmen, coachmen, *&c.*

VALETUDINARY, among medical writers, denotes a perſon of a weak and ſickly conſtitution, and frequently out of order.

VALID, in law, an appellation given to acts, deeds, tranſactions, *&c.* which are clothed with all the formalities requiſite to their being put into execution.

VALLADOLID, a city of Old Caſtile, in Spain, eighty-ſix miles north-weſt of Madrid: W. long. 4° 50′, and N. lat. 41° 36′.

VALLENGIN, the capital of a county of the ſame name, in Switzerland, ſituated near the lake of Neufchattel, twenty-five miles north-weſt of Bern.

VALLISNERIA, in botany, a genus of the dicœcia diandria claſs. The ſpatha both of male and female conſiſts of two ſegments, and the corolla of three petals; the ſpadix of the male is covered with floſcules; the capſule has one cell, containing many ſeeds; and there are three ſtyli. There is but one ſpecies, a native of Italy.

VALOIS, a duchy of France, ſituated on the three great rivers, the Seine, the Marne, and the Oyſe.

VALUE, in commerce, denotes the price or worth of any thing

VALUED RENT, in Scots law. See LAW, Tit. xii. 6.

VALVE, in hydraulics, pneumatics, *&c.* is a kind of lid, or cover, of a tube or veſſel, ſo contrived as to open one way; but which, the more forcibly it is preſſed the other way, the cloſer it ſhuts the aperture; ſo that it either admits the entrance of a fluid into the tube or veſſel, and prevents its return; or admits its eſcape, and prevents its re-entrance.

VALVE, in anatomy, a thin membrane applied on ſeveral cavities and veſſels of the body, to afford a paſſage to certain humours going one way, and prevent their reflux towards the place from whence they came.

VAN, a term derived from the French *avant*, or *avaunt*, ſignifying *before*, or *foremoſt* of any thing: thus we ſay, the van-guard of an army, *&c.*

VANDALIA, the ancient name of the countries of Mecklenburg and Pomerania, in Germany.

VANELLUS, in ornithology. See TRINGA.

VAPOUR, in philoſophy, the moiſt and moſt volatile particles of bodies, ſeparated by heat, and raiſed into the atmoſphere. See RAIN.

VAPOURS, in medicine, a diſeaſe properly called hypo, or the hypochondriacal diſeaſe, and in men particularly the ſpleen. See MEDICINE, p. 148.

VARI, in medicine, little hard and ruddy tumours, which frequently infeſt the faces of young perſons of a hot temperament of body.

VARIATION, in geography and navigation, is the deviation of the magnetical needle, in the mariner's compaſs, from the true north point, towards either the eaſt or weſt; or it is an arch of the horizon, intercepted between the meridian of the place of obſervation and the magnetic meridian. See NAVIGATION.

VARIEGATION, among botaniſts and floriſts, the act of ſtreaking or diverſifying the leaves, *&c.* of plants and flowers with ſeveral colours.

Variegation is either natural or artificial. Of natural variegation there are four kinds; the firſt ſhewing itſelf in yellow ſpots here and there in the leaves of plants called by gardeners the yellow bloach. The ſecond kind, called the white bloach, marks the leaves with a great number of white ſpots or ſtripes; the whiteſt lying next the ſurface of the leaves, uſually accompanied with other marks of a greeniſh white, that lie deeper in the body of the leaves. The third, and moſt beautiful, is where the leaves are edged with white, being owing to ſome diſorder or infection in the juices, which ſtains the natural complection or verdure of the plant. The fourth kind is that called the yellow edge.

Artificial variegation is performed by inarching or inoculating a ſtriped or variegated plant into a plain one of the ſame ſort; as a variegated common jeſſamin into a plain, common, Spaniſh, Brazil, or Indian jeſſamin.

A ſingle bud or eye, Mr Bradly obſerved, being placed in the eſcutcheon of a diſtempered tree, where it can only receive nouriſhment from the vitiated juices, will become variegated proportionably to the nouriſhment it draws; and will partake more of the white and yellow juice, than if a branch ſhall be inarched, the bud having nothing to nouriſh it but the juices of the plant it is inoculated on; whereas a cyon inarched is fed by the ſtriped plant, and the healthful one.

As to the natural ſtripes and variegations, there are ſome particular circumſtances to be obſerved: 1. That ſome plants only appear variegated or bloached in the ſpring and autumn, the ſtains diſappearing as they gather ſtrength: of this kind are rue, thyme and marjoram. 2. Some plants are continually bloached in the ſpongy part of their

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their leaves, the ſap-veſſels all the time remaining of a healthful green; which, being ſtrengthened by rich manure, or being inarched in healthful plants, throw off the diſtemper. 3. In other plants, the diſeaſe is ſo rooted and inveterate, that it is propagated with the ſeed: ſuch are the arch-angel, water-betony, bank-creſs, borrage, ſtriped cellary, and ſycomore; the ſides of which produce ſtriped plants.

VARIOLÆ, the SMALL-POX. See MEDICINE, p. 75.

VARIX, in medicine, the dilatation of a vein, ariſing from the too great abundance or thickneſs of the blood.

VARNISH, a thick, viſcid, ſhining liquor, uſed by painters, gilders, and various other artificers, to give a gloſs and luſtre to the works; as alſo to defend them from the weather, duſt, &c.

There are ſeveral kinds of varniſhes in uſe; as the ſiccative or drying varniſh, made of oil of aſpin, turpentine, and ſandarach melted together. White varniſh, called alſo Venetian varniſh, made of oil of turpentine, fine turpentine, and maſtic. Spirit of wine varniſh, made of ſandarach, white amber, gum elmi, and maſtic; ſerving to gild leather, picture-frames, &c. withal.

1. To make the white varniſh: take gum ſundarach, of the cleareſt and whiteſt ſort, eight ounces; gum maſtic, of the cleareſt ſort, half an ounce; of ſarcocolla, the whiteſt, three quarters of an ounce; Venice turpentine, an ounce and a half; benzoin, the cleareſt, one quarter of an ounce: white roſin, one quarter of an ounce; gum animæ, three quarters of an ounce: let all theſe be diſſolved, and mixed in the manner following:

Put the ſarcocolla and roſin into a little more ſpirits than will cover them to diſſolve; then add the benzoin, gum animæ, and venice-turpentine, into either a glaſs or glazed earthen veſſel, and pour on as much ſpirits as will cover them an inch; then put the gum maſtic into a glaſs or glazed veſſel, and pour ſtrong ſpirits upon it, covering it alſo about an inch thick, to diſſolve it rightly; then put your gum elemi into a diſtinct veſſel as before, and cover it with ſpirits to diſſolve.

For this purpoſe, you need only break the roſin a little, and powder the gum animæ, ſarcocolla, and benzoin.

Let all ſtand three or four days to diſſolve, ſhaking the glaſſes, &c. two or three times a-day, and afterwards put them all together into a glazed veſſel, ſtirring them well, and ſtrain the liquor and gums gently, beginning with the gums, through a linen cloth.

Then put it into a bottle, and let it ſtand a week before you uſe it, and pour off as much of the clear only, as you think ſufficient for preſent uſe.

A hard varniſh that will bear the muffle may be thus made: Take of colophony, an ounce; ſet it over the fire in a well-glazed earthen veſſel, till it is melted; then by little and little, ſtrew in two ounces of powder of amber, keeping it ſtirring all the while with a ſtick; and when you perceive it begin to harden or reſiſt the ſtick, then put in a little turpentine oil, which will thin and ſoften it immediately; then put in two ounces of gum copal, finely powdered, ſprinkling it in as you did the amber, now and then pouring in a little oil of turpentine; and when it is done, ſtrain it as before directed.

This is proper to varniſh over gold; and the things done with it muſt be ſet into a declining oven, three or four days ſucceſſively, and then it will reſiſt even the fire itſelf.

To make a varniſh for gold, or metals made in imitation of gold. Take colophony, and, having melted it, put in two ounces of amber finely powdered, and ſome ſpirit of turpentine; and, as the amber thickens, keep it well ſtirring: then put in an ounce of gum elemi, well pulverized, and more ſpirit of turpentine; conſtantly ſtirring the liquor till all is well mixed and incorporated: but take care, however, to uſe as little turpentine as you can, becauſe the thicker the varniſh is made, the harder it will be. Let this be done over a ſand-heat, in an open-glaſs: then ſtrain it, as is directed for the preceding varniſh. This varniſh is to be uſed alone, firſt warming the veſſels made of paper paſte; and lay it on with a painting-bruſh before the fire, but not too near, leſt the fire raiſe it into bliſters. After this has been done, harden it three ſeveral times in ovens; firſt with a ſlack heat, the next with a warmer, and the third with a very hot one; and the veſſels will look like poliſhed gold.

And as for ſuch veſſels, &c. as ſhall be made with ſaw duſt and gums, the varniſh may be made of the ſame ingredients as above-mentioned, except the gum elemi; and this will dry in the ſun, or in a gentle warmth.

To make a varniſh for any thing covered with leaf-ſilver. Firſt paint the thing over with ſize, and ground chalk or whiting; let them ſtand till they are thoroughly dry, and then do them over with very good gold-ſize of a bright colour (for there is much difference in the colour of it, ſome being yellow, and others almoſt white; the firſt is moſt proper for gold, and the laſt for ſilver. When this ſize is ſo dry as that it will juſt ſtick a little to the touch, lay on the leaf-ſilver, and cloſe it well to the ſize.

To make a varniſh for ſilver. Melt, in a well-glazed pipkin, ſome fine turpentine, and put in three ounces of white amber finely powdered (more or leſs, according to the quantity your work will require;) put it in by little and little, keeping it continually ſtirring, adding by degrees ſome ſpirit of turpentine, till all the amber is diſſolved; and then add to it an ounce of ſarcocolla well beaten, and an ounce of gum elemi well levigated, adding now and then a little ſpirit of turpentine, till all is diſſolved: do this over a gentle fire, and keep it conſtantly ſtirring.

This varniſh will be as white and ſtrong as the former; and is to be uſed warm, and hardened by degrees in an oven, as varniſhed gold, whereby it will look like poliſhed ſilver.

Laying on of VARNISHES. 1. If you varniſh wood, let your wood be very ſmooth, cloſe-grained, free from greaſe, and rubbed with ruſhes. 2. Lay on your colours as ſmooth as poſſible; and, if the varniſh has any bliſters in it, take them off by a poliſh with ruſhes. 3. While you are varniſhing, keep your work warm, but not too hot. 4. In laying on your varniſh, begin in the middle, and ſtroke the bruſh to the outſide; then to another extreme part, and ſo on till all be covered: for if you begin at the edges, the bruſh will leave blots there, and make the work unequal. 5. In fine works uſe the fineſt tripoli in poliſhing: do not poliſh it at one time only; but after the firſt time, let it dry for two or three days, and poliſh it again for the laſt time. 6. In the firſt poliſhing, you muſt uſe a good deal of tripoli; but in the next a very little

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little will ſerve: when you have done, waſh off your tripoli with a ſponge and water: dry the varniſh with a dry linen rag; and clear the work, if a white ground, with oil and whiting; or, if black, with oil and lamp-black.

VARNISH alſo ſignifies a ſort of ſhining coat, wherewith potter's ware, delf ware, china ware, &c. are covered, which gives them a ſmoothneſs and luſtre. Melted lead is generally uſed for the firſt, and ſmalt for the ſecond.

VARNISH, among medaliſts, ſignifies the colours antique medals have acquired in the earth.

The beauty which nature alone is able to give to medals, and art has never yet attained to counterfeit, enhances the value of them; that is, the colour, which certain ſoils, in which they have a long time lain, tinges the metals withal; ſome of which are blue, almoſt as beautiful as the turquoiſe; others with an immitable vermilion colour; others with a certain ſhining poliſhed brown, vaſtly finer than braſil figures.

The moſt uſual varniſh is a beautiful green, which hangs to the fineſt ſtrokes without effacing them, more accurately than the fineſt enamel does on metals.

No metal but braſs is ſuſceptible of this; for the green ruſt that gathers on ſilver always ſpoils it, and it muſt be got off with vinegar or lemon-juice.

Falſifiers of medals have a falſe or modern varniſh, which they uſe on their counterfeits, to give them the appearance, or air, of being antique. But this may be diſcovered by its ſoftneſs, it being ſoftner than the natural varniſh, which is as hard as the metal itſelf.

Some depoſit their ſpurious metals in the earth for a conſiderable time, by which means they contract a ſort of varniſh, which may impoſe upon the leſs knowing; others uſe ſal armoniac, and others burnt paper.

VAS, a veſſel either for mechanical, chemical, culinary, or any other uſes. In anatomy, all the parts which convey a fluid are called veſſels, as the veins, arteries, and lymphatics.

VASCULAR, ſomething conſiſting of divers veſſels; as arteries, veins, nerves, &c.

VASCULIFEROUS PLANTS, ſuch whoſe ſeeds are contained in veſſels, which are ſometimes divided into cells.

VASE, a term frequently uſed for ancient veſſels dug from under ground, or otherwiſe found, and preſerved in the cabinets of the curious.

In architecture, the appellation vaſe is alſo given to thoſe ornaments placed on corniches, ſockles, or pedeſtals, repreſenting the veſſels of the ancients, particularly thoſe uſed in ſacrifice: as incenſe-pots, flower-pots, &c.

VASSAL, denotes a tenant that holds land in fee of his lord.

VASSAL, in Scots law. See LAW, Tit x. 3.

VASTUS, in anatomy. See ANATOMY, p 207.

VATERIA, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of five petals, and the calix of five ſegments; the capſule has three valves, and one cell containing three ſeeds. There is but one ſpecies, a native of India.

VATICAN, a magnificent palace of the pope, in Rome, which is ſaid to conſiſt of ſeveral thouſand rooms: but the parts of it moſt admired are the grand ſtair-caſe, the pope's apartment; and eſpecially the library, which is one of the richeſt in the world, both in printed books and manuſcripts.

VAUDEMONT, the capital of a county of the ſame name in Lorrain, fifteen miles ſouth-weſt of Nancy.

VAUDOIS, are certain valleys ſituated north of the marquiſate of Saluzzo, in Italy: the chief town is Lucerne.

VAULT, in architecture, an arched roof, ſo contrived that the ſtones which form it ſuſtain each other.

Vaults are, on many occaſions, to be preferred to ſoffits or flat ceilings, as they give a greater height and elevation, and are beſides more firm and durable.

VAUR, a town of Languedoc, in France, eighteen miles weſt of Toulouſe.

UBEDA, a city of Andaluſia, in Spain, forty-five miles north-eaſt of Granada: W. long. 3° 6′, N. lat. 38°.

UBERLINGEN, a town of Swabia, in Germany, ten miles north of Conſtance.

UBES, or *St.* UBES, a city and port-town of Portugal, ſituated on a fine bay, twenty-one miles ſouth of Liſbon.

UBIQUITARIANS, in church-hiſtory, a ſect of heretics who ſprung up in Germany about the year 1590, and maintained that the body of Jeſus Chriſt is *ubique*, everywhere, or in every place, at the ſame time. However, they were not quite agreed among themſelves; ſome holding, that the body of Jeſus Chriſt, even during his mortal life, was every where; and others dating the ubiquity of his body from the time of his aſcenſion only.

UBIQUITY, omnipreſence; an attribute of the Deity, whereby he is always intimately preſent to all things.

UDDER, that part in brutes wherein the milk is prepared; anſwering to the mammæ, or breaſts, in women.

VECTOR, in aſtronomy, a line ſuppoſed to be drawn from any planet moving round a centre, or the focus of an ellipſis, to that centre or focus.

VEDETTE, in the military art, a ſentinel on horſeback, detached from the main body of the army to diſcover and give notice of the enemy's deſigns.

VEER, a ſea-term variouſly uſed. Thus veering out a rope, denotes the letting it go by hand, or letting it run out of itſelf. It is not uſed for letting out any running rope except the ſheet.

VEER is alſo uſed in reference to the wind; for, when it changes often, they ſay it veers about.

VEGETABLE, a term applied to all plants, conſidered as capable of growth; *i. e.* all natural bodies which have parts organically formed for accretion, but not ſenſation.

VEGETATION, the act whereby plants receive nouriſhment, and grow. See AGRICULTURE, p. 40.

VEGETATIVE SOUL, among philoſophers, denotes that principle in plants, by virtue of which they vegetate, or receive nouriſhment and grow.

VEHICLE, in general, denotes any thing that carries or bears another along; but is more particularly uſed in pharmacy for any liquid ſerving to dilute ſome medicine, in order that it may be adminiſtered more commodiouſly to the patient.

VEIL, a piece of ſtuff, ſerving to cover or hide any thing.

In the Romiſh churches, in time of Lent, they have veils or curtains over the altar, crucifix, images of ſaints, &c.

A veil or crape is wore on the head by nuns, as a badge of their profeſſion: the novices wear white veils; but thoſe who have made the vows, black ones.

VEIN, in anatomy. See ANATOMY, p. 237.

VEIN, among miners, is that ſpace which is bounded with woughs, and contains ore, ſpar, canck, clay, chirt, creil, brownben,

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brownhen, pitcher-chirt, cur, which the philoſophers call the mother of metals, and ſometimes ſoil of all colours. When it bears ore, it is called a quick vein; when no ore, a dead vein.

VELA, a remarkable cape on the coaſt of Terra Firma, in W. long. 73° 30′, and N. lat. 12°.

VELARIUS, in antiquity, an officer in the court of the Roman emperors, being a kind of uſher, whoſe poſt was behind the curtain in the prince's apartments; as that of the chancellor's was at the entry of the baluſtrade, and that of the oſtiarii at the door. The velarii had a ſuperior of the ſame denomination who commanded them.

VELAY, the north-eaſt diviſion of Languedoc, in France.

VELITES, in the Roman army, a kind of ancient ſoldiery, who were armed lightly with a javelin, a caſk, cuiraſſe, and ſhield.

VELLEITY, in the ſchool-philoſophy, is uſually defined a languid, cold, and remiſs will. Others ſay, it implies an impotency of obtaining what we require.

VELLA, in botany, a genus of the tetradynamia ſiliculoſa claſs. The diſſepimentum of the pod is about twice as large as the valves, and oval on the outſide. There are two ſpecies, only one of them, *viz.* the annua, or creſs-rocket, a native of Britain.

VELOCITY, ſwiftneſs, or that affection of motion whereby a moving body is diſpoſed to run over a certain ſpace in a certain time. See MECHANICS, and HYDROSTATICS.

VELVET, a rich kind of ſtuff, all ſilk, covered on the outſide with a cloſe, ſhort, fine, ſoft ſhag, the other ſide being a very ſtrong cloſe tiſſue.

The principal and beſt manufactories of velvet are in France and Italy, particularly in Venice, Milan, Florence, Genoa, and Lucca: there are others in Holland, ſet up by the French refugees, whereof that at Harlem is the moſt conſiderable; but they all come ſhort of the beauty of thoſe in France.

VENAL, or VENOUS, among anatomiſts, *&c.* ſomething that bears a relation to the veins.

This word is alſo uſed for ſomething bought with money, or procured by bribes.

VENEERING, a kind of marquetry, or inlaying, whereby ſeveral thin ſlices or leaves of fine woods, of different kinds, are applied and faſtened on a ground of ſome common wood.

VENEREAL, ſomething belonging to venery; as the lues venerea, *&c.*

VENERY, is uſed for the act of copulation, or coition, of the two ſexes.

VENESECTION, or PHLEBOTOMY, in ſurgery. See SURGERY, p. 641.

VENETIAN BOLE, a fine red earth uſed in painting, and called in the colour-ſhops Venetian red.

It is dug in Carinthia, and ſent from Venice to all parts of the world, being an excellent colour, and very cheap: our colour-men, however, find many ways of adulterating it.

VENEZUELA, a province of Terra Firma, lying on the northern ocean, and having new Andaluſia on the eaſt, new Granada on the ſouth, and the river De la Hacha on the weſt.

VENIAL, in the Romiſh theology, a term applied to ſlight ſins, and ſuch as eaſily obtain pardon.

VENICE, the capital of a republic in Italy, of the ſame name, is ſituated in the Lagunes, or ſmall iſlands, of the gulph of Venice, about five miles from the continent: E. long. 13°, and N. lat. 45° 40′.

Venice is ſo happily ſituated, that no army can approach it by land; the avenues to thoſe iſlands being ſo exceeding difficult, that they have not thought it neceſſary to incloſe the city with a wall.

Nothing can appear more beautiful than this city, as we approach it either from the continent or the ſea, with its numerous palaces and lofty towers: its circumference is about ſix miles, and its inhabitants are computed at two hundred thouſand.

VENIRE FACIAS, in law, is a judicial writ lying where two parties plead and come to iſſue; directed to the ſheriff, to cauſe twelve men, of the ſame neighbourhood, to meet, and try the ſame, and to ſay the truth upon the iſſue taken.

VENT, VENT-HOLE, or SPIRACLE, a little aperture left in the tubes or pipes of fountains, to facilitate the air's eſcape; or, on occaſions, to give them air, as in froſty weather, *&c.* for want of which they are apt to burſt.

VENTER, in anatomy, the ſame with abdomen. See ANATOMY, p. 256.

VENTIDUCTS, in building, are ſpiracles or ſubterraneous places, where freſh, cool wind being kept, they are made to communicate, by means of tubes, funnels or vaults, with the chambers or other apartments of a houſe, to cool them in ſultry weather.

VENTILATOR, a well-known machine, by which the noxious air of any cloſe place, as an hoſpital, goal, ſhip, chamber, *&c.* may be changed for freſh air.

VENTRICLE, properly denotes any little cavity; but is more particularly uſed, by phyſicians and anatomiſts, for the ſtomach.

VENUS, in aſtronomy. See ASTRONOMY, p. 436.

VERA CRUZ, a port-town of Mexico, with a ſtrong and commodious harbour, ſituated on the gulph of Mexico, in W. long. 100°, N. lat. 18° 30′.

VERAGUA, a province of Mexico, ſituated on the South Sea, weſtward of the gulph of Panama.

VERATRUM, in botany, a genus of the polygamia monoecia claſs. Neither male nor hermaphrodite have any calix; the corolla of each conſiſts of ſix petals, and they have each ſix ſtamina; the hermaphrodite has three piſtilli, and three capſules containing many ſeeds. There are three ſpecies, none of them natives of Britain.

VERB, in grammar. See GRAMMAR, p. 734.

VERBAL, ſomething that belongs to verbs, or even to words of any kind ſpoken with the mouth.

VERBAL *Agreement*, in Scots law. See LAW, Tit. xxi. 1. *&c.*

VERBASCUM, in botany, a genus of the pentandria monogynia claſs. The corolla is rotated, and ſomewhat unequal; and the capſule has two cells, and two valves. There are twelve ſpecies, four of them natives of Britain, *viz.* the thapſus, or great white mullein, the leaves of which are emollient; the lychnitis, or hoary mullein; the nigrum, or black mullein; and the blattoria, or yellow moth-mullein.

VERBENA, in botany, a genus of the diandria monogynia claſs. The corolla is funnel-ſhaped, and crooked; one tooth of the calix is truncated; and it has two or four

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four naked ſeeds. There are 16 ſpecies, only one of them, *viz.* the officinalis, or vervain, a native of Britain.

VERBERATION, in phyſics, a term uſed to expreſs the cauſe of ſound, which ariſes from a verberation of the air, when ſtruck in divers manners by the ſeveral parts of the ſonorous body firſt put into a vibratory motion.

VERBESINA, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is paleaceous; the pappus is furniſhed with an awn; the calix is double; and it has about five floſcules in the radius. There are 13 ſpecies, none of them natives of Britain.

VERD or CAPE-VERD, a promontory of Africa, forty miles north-weſt of the mouth of the river Gambia: W. long. 18°, N. lat. 15°.

There are a number of iſlands in the Atlantic ocean, called Cape-Verd iſlands, from their being ſituated off this cape.

VERDIGREASE, a kind of ruſt of copper, much uſed by painters as a green colour.

Verdigreaſe is properly no other than copper diſſolved by a mild acid into the form of an ærugo, or ruſt.

This ruſt of copper is rarely uſed internally; nor ought it, unleſs in the moſt deſperate caſe, where inſtantaneous vomiting is neceſſary. Externally it is much uſed as a detergent or deſiccative: it eats off fungous fleſh in ulcers, and, mixed with honey, is uſed in aphthæ and ulcerations of the mouth.

VERDICT, is the anſwer of the jury given to the court, concerning the matter of fact, in any caſe civil or criminal, committed by the court to their trial and examination.

VERDITER, or VERDETER, a kind of mineral ſubſtance, ſometimes uſed by the painters, *&c.* for a blue; but more uſually mixed with a yellow for a green colour.

VERDOY, in heraldry, denotes a bordure of a coat of arms, charged with any kinds or parts of flowers, fruits, ſeeds, plants, *&c.*

VERGETTE, in heraldry, denotes a pallet, or ſmall pale; and hence, a ſhield divided by ſuch pallets is termed vergette. See PALE.

VERIFICATION, in general, is the act of proving a thing; but among the French, it only ſignifies the recording of the king's edicts by the parliament.

VERJUICE, a liquor obtained from grapes or apples, unfit for wine or cyder; or from ſweet ones, whilſt yet acid and unripe. Its chief uſe is in ſauces, ragouts, *&c.* though it is alſo an ingredient in ſome medicinal compoſitions, and is uſed by the wax-chandlers to purify their wax.

VERMICELLI, a compoſition of flour, cheeſe, yolks of eggs, ſugar, and ſaffron, reduced to a paſte, and formed into long ſlender pieces like worms, by forcing it with a piſton through a number of little holes.

It was firſt brought from Italy, where it is in great vogue: it is chiefly uſed in ſoups and pottages, to provoke venery, *&c.*

VERMICULAR, an epithet given to any thing that bears a relation or reſemblance to worms.

VERMIFORMIS, in anatomy, a term applied to various parts in the human body, bearing ſome reſemblance to worms.

VERMILION, a very bright and beautiful red colour, in great eſteem among the ancients, under the name of minium. There are two kinds of it, the one natural, the other factitious. The natural is found in ſome ſilver mines, in the form of a ruddy ſand, which is afterwards prepared and purified by ſeveral lotions and coctions. The artificial is made of mineral cinnabar, ground up with aqua-vitæ and urine, and afterwards dried.

It is alſo made of lead burnt and waſhed, or of ceruſs prepared by fire: but this is not properly called vermilion, but minium, or red-lead.

VERMIN, a collective name including all kinds of little animals, or inſects, which are hurtful or troubleſome to men, beaſts, fruits, *&c.* as worms, lice, fleas, caterpillars, ants, flies, *&c.*

VERNACULAR, is applied to any thing that is peculiar to ſome one country.

VERNAL, ſomething belonging to the ſpring ſeaſon.

VERONA, a city of Italy, in the territory of Venice, capital of the Veroneſe, ſituated on the Adige: E. long. 11° 15′, N. lat. 45° 20′.

VERONICA, in botany, a genus of the diandria monogynia claſs. The corolla is rotated, and conſiſts of four ſegments, the loweſt one being leſs than all the reſt; and the capſule has two cells. There are 34 ſpecies, 13 of them natives of Britain.

VERSAILLES, a town of France, in the province of the iſle of France, ſituated eleven miles weſt of Paris, where ſtands one of the moſt elegant and magnificent palaces in the world, built by Lewis XIV.

VERSE, in poetry, a line or part of a diſcourſe, conſiſting of a number of long and ſhort ſyllables, which run with an agreeable cadence, the like being alſo reiterated in the courſe of the piece.

VERSE, is alſo uſed for a part of a chapter, ſection, or paragraph, ſubdivided into ſeveral little articles.

VERSIFICATION, the art or manner of making verſe; alſo the tune and cadence of verſe.

Verſification is properly applied to what the poet does more by labour, art, and rule, than by invention.

VERSION, a tranſlation of ſome book or writing, out of one language into another.

VERT, in heraldry, the term for a green colour. It is called vert in the blazon of the coats of all under the degree of nobles; but in coats of nobility, it is called emerald; and in thoſe of kings, venus. In engraving, it is expreſſed by diagonals, or lines drawn athwart from right to left, from the dexter chief corner to the ſiniſter baſe, as repreſented in Plate CXLVII. fig. 23.

VERTEBRÆ, in anatomy. See ANATOMY, p. 166.

VERTEX, in anatomy, denotes the crown of the head.

Hence vertex is alſo uſed figuratively, for the top of other things: thus, the vertex of a cone, pyramid, *&c.* is the top of any one of theſe figures.

VERTEX is alſo uſed in aſtronomy, for the point of heaven perpendicularly over our heads, properly called the zenith.

VERTICILLATE PLANTS. See BOTANY, p. 637.

VERTICITY, is that property of the loadſtone, whereby it turns, or directs itſelf to ſome peculiar point.

VETIGO, in medicine. See MEDICINE, p. 146.

VERVAIN, in botany. See VERBENA.

VERU-MONTANUM, in anatomy. See ANATOMY, p. 273.

VESICA,

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VESICA, in anatomy. See ANATOMY, p. 269.

VESICATORIUM, an external medicine, ſerving to raiſe a bliſter; whence alſo it is itſelf, though improperly, called a bliſter.

We have veſicatories made of cantharides, euphorbium, figs, ſublimate of mercury, lapis infernalis, muſtard, anacardium, ſquills, briony, vinegar, pepper, leaven, *&c.*

VESICULA, a diminutive of veſica, ſignifying a little bladder.

VESPA, the WASP, in zoology, a genus of inſects belonging to the order of hymenoptera. The mouth conſiſts of two jaws without any proboſcis; the ſuperior wings are plaited; there is a ſharp ſting in the tail; and the eyes are lunar. There are 28 ſpecies. The common waſps live in ſocieties like the bee. See APIS.

VESPERS, in the church of Rome, denote the afternoon ſervice; anſwering, in ſome meaſure, to the evening-prayers of the church of England.

VESPERTILIO, the BAT, in zoology, a genus of quadrupeds belonging to the order of primates. All the the teeth are erect, pointed, near each other, and the firſt four are equal; the fore-feet have the toes connected by a membrane expanded into a kind of wings, by which the creature is enabled to fly. They fly about in the night, and feed upon moths.

VESPERTILIONUM ALÆ, in anatomy. See ANATOMY, p. 275.

VESSEL, denotes in general any thing for holding liquors; ſuch are our domeſtic cups, pots, *&c.* as alſo the retorts, matraſſes, crucibles, *&c.* For the theory and conſtruction of chemical veſſels, ſee CHEMISTRY, p. 108.

In anatomy, all the parts which contain or convey a fluid are called veſſels; as the veins, arteries, lymphatics.

VESSEL, in navigation, a general name for all ſorts of ſhips. See SHIP.

VESTALIA, in Roman antiquity, a feſtival celebrated in honour of the goddeſs Veſta, on the fifth of the ides of June; that is, on the ninth of that month.

VESTALS, among the ancient Romans, were prieſteſſes of the goddeſs Veſta, and had the perpetual fire committed to their charge: they were at firſt only four in number, but afterwards increaſed to ſix; and it does not appear that their number ever exceeded ſix, among whom one was ſuperior to the reſt, and called *veſtalis maxima.*

The veſtals were choſen from ſix to ten years of age, and obliged to ſtrict continuency for thirty years; the firſt ten of which were employed in learning the ceremonies of religion, the next ten in the performance of them, and the ten laſt in teaching them to the younger veſtals.

The habit of the veſtals conſiſted of an head-dreſs, called infula, which ſat cloſe to their heads, and from whence hung certain laces called vittæ; a kind of ſurplice made of white linen, and over it a purple mantle with a long train to it.

VESTIBLE, in architecture, a kind of entrance into a large building; being an open place before the hall, or at the bottom of the ſtair-caſe

VESTIBLE *of the ear*, in anatomy. See ANATOMY, p. 297.

VESTRY, a place adjoining to a church, where the veſtments of the miniſter are kept; and alſo a meeting at ſuch place, conſiſting of the miniſter, church-wardens, and chief men of moſt pariſhes, who make a pariſh veſtry or meeting. By cuſtom there are ſelect veſtries, being a certain number of perſons choſen to have the government of the pariſh, make rates, and take the accounts of church-wardens, *&c.*

VESUVIUS, a famous volcano, or burning mountain, ſituated only ſix miles eaſt of the city of Naples, in Italy. See VOLCANO.

VETCH, in botany. See VICIA.

VETERAN, among the ancient Romans, an appellation given to a ſoldier who was grown old in the ſervice, or had made a certain number of campaigns.

VIALES, in mythology, a name given among the Romans to the gods who had the care and guard of the roads and high-ways.

VIATICUM, in the church of Rome, an appellation given to the euchariſt when adminiſtered to perſons at the point of death.

VIATOR, in Roman antiquity, an appellation given in common to all officers of any of the magiſtrates; as lictors, accenſi, ſcribes, criers, *&c.*

VIBEX, is ſometimes uſed, by phyſicians, for a black and blue ſpot in the ſkin, occaſioned by an afflux or extravaſation of blood.

VIBRATION, in mechanics, a regular, reciprocal motion of a body, as a pendulum, *&c.*

VIBURNUM, in botany, a genus of the pentandria trigynia claſs. The calix is above the fruit, and conſiſts of five ſegments; the corolla has likewiſe five ſegments, and the berry contains one ſeed. There are nine ſpecies, two of them natives of Britain, *viz.* the lantana, or way-faring tree; and the opulus, or water-elder.

VICAR, a perſon appointed, as deputy to another, to perform his functions in his abſence, and under his authority.

VICAR, in the canon law, denotes a prieſt of a pariſh, the predial tithes whereof are impropriated or appropriated; that is, belong either to a chapter, religious houſe, *&c.* or to a layman, who receives them, and only allows the vicar the ſmall tithes, or a convenient ſalary.

VICE, in ethics, is ordinarily defined an elective habit, deviating, either in exceſs, or defect, from the juſt medium wherein virtue is placed.

VICE, in ſmithery, and other arts employed in metals, is a machine, or inſtrument, ſerving to hold faſt any thing they are at work upon, whether it is to be filed, bent, rivetted, *&c.*

VICE is alſo uſed, in the compoſition of divers words, to denote the relation of ſomething that comes inſtead, or in the place, of another; as vice-admiral, vice-chancellor, vice chamberlain, vice-preſident, *&c.* are officers who take place in the abſence of admirals, *&c.*

VICE-ROY, a governor of a kingdom, who commands in the name and ſtead of a king, with full and ſovereign authority. See KING.

VICIA, in botany, a genus of the diadelphia decandria claſs. The under ſide of the ſtigma is tranſverſely bearded. There are 18 ſpecies, ſix of them natives of Britain, *viz.* the eracca, or tufted wood-vetch; the ſepium, or buſh-vetch; the ſativa, or common vetch; the lathyroides, or wild-vetch; and the lutea, or yellow vetch.

VICISSITUDE, the regular ſucceſſion of one thing after another; as the viciſſitude of day and night, of the ſeaſons. *&c.*

VISCOUNT, a degree of nobility next below a count, or earl, and above a baron.

VICTIM, denotes a bloody ſacrifice, offered to ſome deity,

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of a living creature, as a man or beaſt, which is ſlain to appeaſe his wrath, or obtain ſome favour.

VICTIMARIUS, in antiquity, a miniſter or ſervant of the prieſt, whoſe office was to bind the victims, and prepare the water, knife, and other things neceſſary for the ſacrifice.

VICTORY, the overthrow or defeat of an enemy, in war or combat.

VICTUALLING-Office, an office kept on Tower-hill, London, for the furniſhing his majeſty's navy with victuals.

VICTUALS, ſignifies any ſuſtenance, or things neceſſary to live upon, as meat and proviſions.

VIENNA, the capital city of the circle of Auſtria and of the German empire, is ſituated on the Danube, in E. long 16° 21′, and N. lat. 48° 20′.

Vienna is an archbiſhop's ſee, and has a celebrated univerſity.

VIGILS, in church-hiſtory, are the faſts appointed before certain feſtivals, in order to prepare the mind for a due obſervation of the enſuing ſolemnity.

VIGO, a port-town of Galicia, in Spain, 70 miles ſouth-eaſt of Cape Finiſterre: W. long. 9° 18′, N. lat. 42° 15′.

VILLA-franca, the name of ſeveral towns, one in Piedmont, three miles eaſt of Nice; another of Catalonia, eighteen miles weſt of Barcelona; a third, the capital of St Michael, one of the Azores; and a fourth, a town of Eſtremadura, in Spain, fifty-four miles ſouth-eaſt of Salamanca.

Villa-franche, a town of Orleanois, in France, twelve miles north of Lyons.

VILLAGE, an aſſemblage of houſes, inhabited chiefly by peaſants and farmers, and having no market, whereby it is diſtinguiſhed from a town.

VILLAIN, or Villein, in our ancient cuſtoms, denotes a man of ſervile and baſe condition, *viz.* a bondman or ſervant.

VILLA-real, the name of two towns; the one in Spain, thirty miles north of Valencia; and the other in Portugal, fifty miles eaſt of Porto.

Villa-rica, a port-town of Mexico, ſituated on the gulph of Mexico, in W. long. 100°, and N. lat. 20°.

VILLENAGE, a kind of ancient tenure, whereby the tenant was bound to do ſuch ſervices as the lord commanded, or ſuch as were fit for villains or bondmen to perform.

VILLI, among botaniſts, a kind of down, like coarſe hair, with which ſome trees abound.

VILLOSE, or Villous, ſomething abounding with villi, or fibres like coarſe hairs: ſuch is one of the coats of the ſtomach.

VINALIA, in Roman antiquity, a feſtival on the ninth of the kalends of May, in honour both of Jupiter and Venus.

VINCA, in botany, a genus of the pentandria monogynia claſs. It has two erect follicles; the ſeeds are plumoſe; and the tube of the corolla terminates in a lacerated corona. There are four ſpecies, two of them natives of Britain, *viz.* the minor, or periwinkle; and major, or greater periwinkle.

Cape VINCENT, the moſt ſouth-weſt promontory of Portugal: W. long. 10°, and N. lat. 36° 55′.

St Vincent, one of the Caribbee iſlands, ſeventy-five miles weſt of Barbadoes.

St Vincent, is alſo a province of Brazil, bounded by the Rio Janiero on the north, by the Atlantic on the eaſt, by the province of del Rey on the ſouth, and by that of the Spaniſh La Plata on the weſt.

VINDEMIATING, the gathering of the grapes, or other ripe fruits, as apples, pears, cherries, *&c.*

VINDEMIATRIX, or Vindemiator, a fixed ſtar of the third magnitude in the conſtellation virgo.

VINE. See Vitis.

VINEGAR, an acid penetrating liquor, prepared from wine, cyder, beer, *&c.* of conſiderable uſe both as a medicine and ſauce. See Chemistry, p. 97, 166.

VINEYARD, a plantation of vines.

The beſt ſituation of a vineyard is on the declivity of an hill, lying on the ſouth.

VINOUS, ſomething that relates to wine, or that has the taſte and ſmell thereof. See Wine.

VINTAGE, a crop of wine, or what is got from the vines each ſeaſon.

VINUM, a liquor or drink commonly called wine. See Wine.

VIOL, a muſical inſtrument of the ſame form with the violin, and ſtruck like that with a bow.

VIOLA, in botany, a genus of the ſyngeneſia monogynia claſs. The calix conſiſts of five leaves, and the corolla of five irregular petals horned behind; the capſule has three valves, and one cell. There are 24 ſpecies, ſeven of them natives of Britain.

VIOLATION, the act of violating, that is, forcing a woman, or committing a rape upon her.

This term is alſo uſed, in a moral ſenſe, for a breach or infringement of a law, ordinance, or the like.

VIOLENT, in the ſchools, a thing done by force; in which ſenſe it ſtands oppoſed to ſpontaneous.

Violent *Profits*, in Scots law. See Law, Tit. xiii. 20.

VIOLET, in botany. See Viola.

VIOLIN, or Fiddle, a muſical inſtrument mounted with four ſtrings, or guts, and ſtruck, or played, with a bow.

VIOLONCELLO, of the Italians is properly our fifth violin; which is a little baſs-violin, half the ſize of the common baſs-violin, and its ſtrings juſt half as thick and half as long, which renders the ſound juſt an octave higher than the ſame.

VIOLONE, in muſick, a double baſs, almoſt twice as big as the common baſs-violin, and the ſtrings bigger and longer in proportion, and conſequently its ſound an octave lower than that of our baſs-violin, which has a noble effect in great concerts.

VIPER, in zoology. See Coluber.

VIRAGO, a woman of extraordinary ſtature and courage; and who, with the female ſex, has the mien and air of a man, and performs the actions and exerciſes of men.

VIRGA aurea, in botany. See Solidago.

Virga sanguinea, in botany. See Cornus.

VIRGIN, a female who has had no carnal commerce with man.

Virgin is alſo applied figuratively to ſeveral things that retain their abſolute purity, and have never been made uſe of.

Virgin islands, very ſmall iſlands of the Caribbees, ſituated in the Atlantic or American-ocean, a little to the eaſtward of Porto-Rico.

VIRGINIA, one of the Britiſh American colonies, ſituated between ſeventy-four and eighty degrees weſt long. and between thirty-ſix and thir tynine degrees of north lat.

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lat. bounded by the river Patowmack, which ſeparates it from Maryland, on the north; by the Atlantic-ocean, on the eaſt; by Carolina, on the ſouth; and may be extended as far weſtward as we think fit.

VIRGINITY, the teſt or criterion of a virgin, or that which intitles her to the denomination.

VIRGO, in aſtronomy, one of the ſigns or conſtellations of the zodiac. See ASTRONOMY, p. 487.

VIRILE, ſomething that belongs or is peculiar to a man, or the male ſex.

VIRTUAL, or POTENTIAL, ſomething that has a power or virtue of acting or doing. The term is chiefly underſtood of ſomething that acts by a ſecret inviſible cauſe, in oppoſition to actual and ſenſible.

VIRTUE, a term uſed in various ſignifications. In the general it denotes power, or perfection of any thing, whether natural or ſupernatural, animate or inanimate, eſſential or acceſſory. But in its more proper or reſtrained ſenſe, virtue ſignifies an habit, which improves and perfects the poſſeſſor and his actions.

VIRTUOSO, an Italian term, lately introduced into Engliſh, ſignifying a man of curioſity and learning, or one who loves and promotes the arts and ſciences: but among us the term ſeems to be appropriated to thoſe who apply themſelves to ſome curious and quaint, rather than immediately uſeful, art or ſtudy; as antiquaries, collectors of rarities of any kind, microſcopical obſervers, *&c.*

VIRULENT, a term applied to any thing that yields a virus, that is, a contagious or malignant pus.

VISCERA, in anatomy, a term ſignifying the ſame with entrails, including the heart, liver, lungs, ſpleen, inteſtines, and other inward parts of the body. See ANATOMY, Part VI.

VISCIDITY, or VISCOSITY, the quality of ſomething that is viſcid or viſcous, that is, glutinous and ſticky, like bird-lime, which the Latins call by the name *viſcus*.

VISCUM, in botany, a genus of the dioecia tetrandria claſs. The calix of both male and female conſiſts of four ſegments; neither of them have any corolla; there are no filaments in the male, the antherae being connected to the calix; the female has no ſtylus; and the berry contains one heart-ſhaped ſeed. There are ſix ſpecies, none of them natives of Britain.

VISIBLE, ſomething that is an object of ſight or viſion, or ſomething whereby the eye is affected, ſo as to produce a ſenſation.

VISIER, an officer or dignitary in the Ottoman empire, whereof there are two kinds; the firſt, called by the Turks viſier-azem, that is, grand viſier, is the prime miniſter of ſtate of the whole empire. He commands the army in chief, and preſides in the divan or great council. Next to him are ſix other ſubordinate viſiers, called viſiers of the bench, who officiate as his counſellors, or aſſeſſors in the divan.

VISION, in optics, the act of ſeeing or perceiving external objects, by means of the organ of ſight, the eye. See ANATOMY, p. 289. and OPTICS.

VISTULA, or WEISEL, a large river of Poland, which, taking its riſe in the mountains ſouth of Sileſia, viſits Cracow, Warſaw, *&c.* and continuing its courſe north, falls into the Baltic ſea below Dantzick.

VISUAL, in general, ſomething belonging to viſion.

VITAL, in phyſiology, an appellation given to whatever miniſters principally to the conſtituting or maintaining of life in the bodies of animals: thus, the heart, lungs, and brain are called vital parts; and thoſe operations of theſe parts, whereby the life of animals is maintained, are called vital functions.

VITEX, in botany, a genus of the didynamia angioſpermia claſs. The corolla conſiſts of ſix ſegments, and the calix of five teeth; and the berry contains four ſeeds. There are four ſpecies, none of them natives of Britain.

VITIS, the VINE, in botany, a genus of the pentandria monogynia claſs. The petals adhere at the apex; and the berry contains five ſeeds. There are ſeven ſpecies, none of them natives of Britain.

VITIS IDAEA, in botany. See VACCINIUM.

VITIOUS INTROMISSION, in Scots law. See LAW, Tit. xxviii. 20.

VITREOUS *Humour of the Eye*. See ANATOMY, p. 289.

VITRIFICATION, in chemiſtry, is the converting a body into glaſs, by means of fire.

VITRIOL, a compound body formed of the particles of metals diſſolved by the acid of ſulphur, and that either by the operations of nature within the earth, or in the chemiſts elaboratory by proper admixtures and aſſiſtances, and afterwards, by the help of water, brought into the form of a ſalt. See CHEMISTRY, p. 81, 132.

VITRIOLATED, among chemiſts, ſomething that has vitriol infuſed in it.

VITRIOLIC, an appellation given to whatever abounds with, or partakes of, the nature of vitriol: thus ſuch foſſil bodies as contain vitriol, are called vitriolic minerals, or ores of vitriol.

VITTA, in anatomy, that part of the amnios which ſticks to an infant's head when juſt born.

VITUS'S DANCE. See MEDICINE, p. 99.

VIVERRA, in zoology, a genus of quadrupeds belonging to the order of ferae. They have ſix fore-teeth, the intermediate ones being ſhorter, and more than three grinders; and the claws are exſerted. There are ſix ſpecies, *viz.* 1. The ichneumon, with the tail tapering towards the point, and the toes diſtant from each other. It is a native of Egypt and India, where it is tamed, and follows its maſter like a dog. It feeds upon lizards, frogs, *&c.* and is particularly an enemy to ſerpents. 2. The naſua, is reddiſh, with white rings on the tail. It is a native of America, and digs the ground in ſearch of worms; it feeds likewiſe upon mice, and fruits; when enraged, it ſends forth an abominable ſtench. 3. The marica is of a duſky colour; it is likewiſe a native of America. 4. The putorius varies in colour, but has generally four white parallel lines on the back. It is a native of North America, is ſlow in its motion, and emits its urine, attended with a moſt diſagreeable ſmell, when enraged. 5. The zibetha, has an annulated tail, and the back is ſtreaked with waves of black and aſh-colour. It is a native of China, and Mexico. It is a fierce and ungovernable animal, and erects the hairs of its back when angry. 6. The genetta has an annulated tail, and the body is ſpotted with a dirty yellow and black colour. It is a native of the Eaſt, and ſmells of muſk.

VIVIPAROUS, in natural hiſtory, an epithet applied to ſuch animals as bring forth their young alive and perfect; in contradiſtinction to them that lay eggs, which are called oviparous animals.

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UKRAIN, a province of Muſcovy, lying northwards of Little Tartary, ſo called as being a frontier againſt Turky.

ULADISLAW, a city of Great Poland, ſituated on the river Boriſthenes, eighty-miles north-weſt of Warſaw: E. long. 19°, and N. lat. 53°.

ULCER, in ſurgery. See SURGERY, p. 646.

ULCERATION, in ſurgery, a little hole in the ſkin, cauſed by an ulcer.

ULEX, in botany, a genus of the diadelphia decandria claſs. The calix conſiſts of two leaves; and the pod is about the length of the calix. There are two ſpecies, one of them, *viz.* the europæus, or furze, a native of Britain.

ULIGINOUS, in agriculture, an appellation given to a moiſt, mooriſh, and fenny ſoil.

ULLAGE, in gauging, is ſo much of a caſk or other veſſel, as it wants of being full.

ULM, an imperial city of Swabia, in Germany, ninety miles ſouth-weſt of Ratiſbon: E. long. 10°, N. lat. 48° 24′.

ULMARIA, in botany. See FILIPENDULA.

ULMUS, in botany, a genus of the pentandria digynia claſs. The calix conſiſts of five ſegments; it has no corolla; and the berry is dry, compreſſed, and membranaceous. There are three ſpecies, two of them natives of Britain, *viz.* the campeſtris, or common elm; and the glabra, or broad-leaved elm.

ULNA, in anatomy. See ANATOMY, p. 178.

ULNARIS, in anatomy. See ANATOMY, p. 199.

ULSTER, the moſt northern province of Ireland, the chief town of which is Londonderry.

ULTERIOR, in geography, is applied to ſome part of a country or province, which, with regard to the reſt of that country, is ſituated on the farther ſide of the river, mountain, or other boundary, which divides the country into two parts.

ULTIMUS HÆRES, in Scots law. See LAW, Tit. xxix. 1, 2.

ULTRAMARINE, a beautiful blue colour uſed by the painters, prepared from lapis lazuli by calcination.

ULTRAMONTANE, ſomething beyond the mountains. The term is principally uſed in relation to Italy and France, which are ſeparated by the mountains of the Alps.

ULVA, in botany, a genus of the cryptogamia algæ claſs, conſiſting of a merely foliaceous ſubſtance, formed into long cylindrical tubes. There are 10 ſpecies, all natives of Britain.

ULULA, in ornithology. See STRIX.

UMBELLÆ. See BOTANY, p. 637.

UMBELLIFEROUS PLANTS, are ſuch as have their tops branched and ſpread out like an umbrella.

UMBILICAL, among anatomiſts, ſomething relating to the umbilicus or navel.

UMBILICUS the NAVEL, in anatomy. See ANATOMY, p. 257. and MIDWIFERY.

UMBONE, a name uſed by ſome for the ſtyle or piſtil of a flower.

UMPIRE, a third perſon choſen to decide a controverſy left to arbitration.

UNCIA, in general, a Latin term denoting the twelfth part of any thing; particularly the twelfth part of a pound, called in Engliſh an ounce; or the twelfth part of a foot, called an inch.

UNCTION, the act of anointing or rubbing with oil or other fatty matter.

UNCTION, in matters of religion, is uſed for the character conferred on ſacred things, by anointing them with oil. Unctions were very frequent among the Hebrews. They anointed both their kings and high-prieſts at the ceremony of their inauguration. They alſo anointed the ſacred veſſels of the tabernacle and temple, to ſanctify and conſecrate them to the ſervice of God. The unction of kings is ſuppoſed to be a ceremony introduced very late among the Chriſtian princes. It is ſaid, that none of the emperors were ever anointed before Juſtinian, or Juſtin. The emperors of Germany took the practice from thoſe of the eaſtern empire: king Pepin of France was the firſt who received the unction. In the ancient Chriſtian church, unction always accompanied the ceremonies of baptiſm and confirmation. Extreme unction, or the anointing perſons in the article of death, was alſo practiſed by the ancient Chriſtians, in compliance with the precept of St James, chap. v. 14. and 15 verſes; and this extreme unction the Romiſh church has advanced to the dignity of a ſacrament. In is adminiſtred to none but ſuch as are afflicted with ſome mortal diſeaſe, or are in a decrepit age. It is refuſed to impenitent perſons, as alſo to criminals. The parts to be anointed are the eyes, the ears, the noſtrils, the mouth, the hands, the feet, and the reins. The laity are anointed in the palms of the hands, but prieſts on the back of it; becauſe the palms of their hands have been already conſecrated by ordination. The parts abovementioned are anointed in the form of a croſs. The prieſt begins anointing the ſick perſon's eyes, ſaying, "May God, by his holy anointing, pardon you the ſins you have committed by the eyes." In like manner he proceeds to the other parts, varying the words according to the parts he anoints.

UNDECAGON, is a regular polygon, of eleven ſides.

UNDECEMVIR, a magiſtrate among the ancient Athenians, who had ten other collegues or aſſociates joined with him in the ſame commiſſion. The function of the undecemviri at Athens were much the ſame as thoſe of the prevots de marechauſſe in France: they took care of the apprehending of criminals, ſecured them in the hands of juſtice, and when they were condemned, took them again into cuſtody, that the ſentence might be executed on them. They were choſen by the tribes, each tribe naming its own; and as the number of the tribes after Calliſthenes was but ten, which made ten members, a ſcribe or notary was added, which made the number eleven.

UNDER *the ſea*, in the ſea-language. A ſhip is ſaid to be ſo when ſhe lies ſtill, or waits for ſome other ſhips, with her helm laſhed, or tied up a-lee.

UNDERSTANDING. See METAPHYSICS, and LOGIC.

UNDERWALD, a canton of Switzerland, bounded by Switz and Lucern on the north, by Uri on the eaſt, and by another part of Lucern on the weſt; being about 25 miles long and as many broad.

UNDERWOOD, is coppice, or any wood that is not accounted timber.

UNDULA-

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UNDULATION, in phyſics, a kind of tremulous motion or vibration obſervable in a liquid, whereby it alternately riſes and falls like the waves of the ſea.

This undulatory motion, if the liquid be ſmooth and at reſt, is propagated in concentric circles, as moſt people have obſerved upon throwing a ſtone or other matter upon the ſurface of a ſtagnant water, or even upon touching the ſurface of the water lightly with the finger or the like. The reaſon of theſe circular indulations is, that by touching the ſurface with your finger, there is produced a depreſſion of the water in the place of contact. By this depreſſion the ſubjacent parts are moved ſucceſſively out of their place, and the other adjacent parts thruſt upwards, which lying ſucceſſively on the deſcending liquid, follow it; and thus the parts of the liquid are alternately raiſed and depreſſed, and that circularly. When a ſtone is thrown into the liquid, the reciprocal vibrations are more conſpicuous.

Undulatory motion is likewiſe applied to a motion in the air, whereby its parts are agitated after the like manner as waves in the ſea; as is ſuppoſed to be the caſe when the ſtring of a muſical inſtrument is ſtruck. This undulatory motion of the air, is ſuppoſed the matter or cauſe of ſound.

UNGUENT, in medicine and ſurgery, a topical remedy or compoſition, chiefly uſed in the dreſſing of wounds and ulcers.

UNGUIS, in anatomy. See ANATOMY, p. 160.

UNGUIS, among botaniſts. See BOTANY, p. 637.

UNGULA, in geometry, the ſection of a cylinder cut off by a plane paſſing obliquely through the plane of the baſe and part of the cylindric ſurface.

UNGULA, in natural hiſtory, the claw or hoof of a quadruped.

UNICORN, an animal famous among the ancients, but looked on by the moderns as fabulous.

UNICORN-FISH, in ichthyology. See MONODON.

UNIFORM denotes a thing to be ſimilar, or conſiſtent, either with another thing or with itſelf, in reſpect of figure, ſtructure, proportion, and the like; in which ſenſe it ſtands oppoſed to diſform.

UNIFORMITY, a ſimilitude, or reſemblance, between the parts of a whole: ſuch is that we meet with in figures of many ſides, and angles reſpectively equal, and anſwerable to each other.

UNIOLA, in botany, a genus of the triandria digynia claſs. The calix conſiſts of many valves; and the ſpica is oval and carinated. There are four ſpecies, none of them natives of Britain.

UNION, a junction, coalition, or aſſemblage of two or more different things in one.

UNION OF LANDS, in Scots law. See LAW, Tit x. 20.

UNION, or the UNION, by way of eminence, is more particularly uſed to expreſs the act whereby the two ſeparate kingdoms of England and Scotland were incorporated into one, under the title of The kingdom of Great-Britain. This happy union, in vain attempted by king James I. was at length effected in the year 1707, by the general conſent of the queen and the eſtates of each realm. The chief articles of this union are, That the two kingdoms ſhall be united into one kingdom, by the name of Great-Britain: that they, in conſequence thereof, be repreſented by one parliament, of which ſixteen peers and forty-five commoners are to be elected for Scotland, and have the ſame privileges with thoſe of England: that the ſubjects of either nation ſhall have equal freedom of trade, and be liable to the ſame cuſtom, and the like laws for public government, *&c.* The kirk or church of Scotland is confirmed; and the courts of juſtice are to remain the ſame as they were before the union, yet ſubject to regulation, *&c.* A court of exchequer is alſo erected in Scotland, to be a court of record, revenue, and judicature, for ever; and barons of the ſaid court are appointed, who ſhall be the judges there.

UNISON, in muſick, the effect of two ſounds which are equal in degree of tune, or in point of gravity and acuteneſs.

UNIT, or UNITY, in arithmetick, the number one, or one ſingle individual part of diſcrete quantity.

UNITED NETHERLANDS conſiſt of the provinces of Holland, Zealand, Frieſland, Groningen, Overyſſel, Gelderland, with Zutphen and Utrecht; theſe are bounded by the German ſea on the north and weſt; by the circle of Weſtphalia, on the eaſt; and by Flanders, Brabant, and the duchy of Cleves, on the ſouth: lying between 3° 20′ and 7° 30′ eaſt longitude, and between 51° 35′ and 52° 40′ north latitude; being about fifty miles long, and as many broad, including the Zuyder-ſea, which takes up a conſiderable ſpace between theſe limits.

UNITY, in poetry. In the drama there are three unities to be obſerved, *viz.* the unity of action, that of time, and that of place. In the epic poem, the great, and almoſt only unity, is that of the action. Some regard indeed ought to be had to that of time; that of place there is no room for. The unity of character is not reckoned among the unities. See COMPOSITION.

UNIVERSAL, ſomething that is common to many things, or it is one thing belonging to many or all things.

UNIVERSE, a collective name, ſignifying the whole world, or the aſſemblage of heaven and earth, with all things therein. See ASTRONOMY, and GEOGRAPHY.

UNIVERSITY, a collective term, applied to an aſſemblage of ſeveral colleges, eſtabliſhed in a city, wherein are profeſſors in the ſeveral ſciences, appointed to teach them to ſtudents, and where degrees or certificates of ſtudy in the divers faculties are taken up.

In each univerſity four faculties are uſually taught, theology, medicine, law, and the arts and ſciences.

They are called univerſities, or univerſal ſchools, by reaſon the four faculties are ſuppoſed to take in the whole compaſs of ſtudy.

Univerſities had their firſt riſe in the XIIth and XIIIth centuries. Thoſe of Paris and Bologna pretend to be the firſt that were ſet on foot; but they were on a different footing from the univerſities among us.

The univerſities of Oxford and Cambridge ſeem entitled to greateſt antiquity of any in the world; and Baliol and Merton colleges in Oxford, and St Peter's in Cambridge, all made colleges in the XIIIth century, may be ſaid to be the firſt regular endowments of this kind in Europe.

The univerſities of Scotland are four, *viz.* thoſe of St. Andrews, Aberdeen, Edinburgh, and Glaſgow. See EDINBURGH. *&c.*

UNIVOCAL, in the ſchools, is applied to two or more names, or terms that have but one ſignification; in oppoſition to equivocal,

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equivocal, which is where one term has two or more ſignifications.

UNLAWFUL, illegal, ſomething prohibited by, or contrary to the terms of law, either divine or human.

UNMOOR, a term uſed at ſea. When a veſſel which was riding at anchor, weighs the ſame, or gets it up, in order to ſail, they ſay ſhe is unmooring.

VOCABULARY, in grammar, denotes the collection of the words of a language, with their ſignifications, otherwiſe called a dictionary, lexicon, or nomenclature. See DICTIONARY.

A vocabulary is properly a leſſer kind of dictionary, which does not enter ſo minutely into the origins and different acceptations of words.

VOCAL, ſomething that relates to the voice or ſpeech: thus vocal muſick is that ſet to words, eſpecially verſes, and to be performed by the voice; in contradiſtinction to inſtrumental muſick, compoſed only for inſtruments, without ſinging.

VOCATIVE, in grammar, the fifth ſtate or caſe of nouns.

When we name the perſon we are ſpeaking to, or addreſs ourſelves to the thing we are ſpeaking of, as if it were a perſon, the noun or name requires a new relation, which the Latins and Greeks expreſs by a new termination, called the vocative; as, from *dominus, a lord*, is formed the vocative *domine, O lord*.

VOICE, a ſound produced in the throat and mouth of an animal, by an aparatus of inſtruments for that purpoſe.

Voices are either articulate or inarticulate. Articulate voices are thoſe whereof ſeveral conſpire together to form ſome aſſemblage or little ſyſtem of ſounds; ſuch are the voices expreſſing the letters of an alphabet, numbers of which joined together form words. Inarticulate voices are ſuch as are not organized, or aſſembled into words; ſuch is the barking of dogs, the braying of aſſes, the hiſſing of ſerpents, the ſinging of birds, *&c.*

The formation of the human voice, with all the varieties thereof obſerved in ſpeech, muſick, *&c.* makes a very curious article of inquiry; and the apparatus and organiſm of the parts adminiſtring thereto, is ſomething exceedingly ſurpriſing. Thoſe parts are the trachea or wind-pipe, through which the air paſſes and repaſſes into the lungs; the larynx, which is a ſhort cylindric canal at the head of the trachea; and the glottis, which is a little oval cleft or chink left between two ſemicircular membranes ſtretched horizontally withinſide the larynx; which membranes, though capable of joining cloſe together, do generally leave an interval either greater or leſs between them called the glottis. A particulr deſcription of each part may be ſeen in Anatomy, Part IV.

VOICE, in grammar, a circumſtance in verbs, whereby they come to be conſidered as either active or paſſive; *i. e.* either expreſſing an action impreſſed on another ſubject, as, *I beat;* or receiving it from another, as *I am beaten*. See GRAMMAR, p 738.

VOICE, in matters of election, denotes a vote or ſuffrage.

VOIDED, in heraldry, is underſtood of an ordinary whoſe inner or middle part is cut out, leaving nothing but its edges to ſhew its form, ſo that the field appears through it. Hence it is needleſs to expreſs the colour or metal of the voided part, becauſe it muſt of courſe be that of the field.

VOIDER, in heraldry, one of the ordinaries whoſe figure is much like that of a flaſk or flaunch, only that it doth not bend ſo much. See Plate CXLVII. fig. 24.

VOL, among heralds, ſignifies the two wings of a fowl joined together, borne in armory, as being the whole that makes the flight. Accordingly, a demi-vol is a ſingle wing.

VOLA, the palm or inſide of the hand, comprehended between the fingers and the wriſt.

VOLANT, in heraldry, is when a bird in a coat of arms is drawn flying, or having its wings ſpread out.

VOLATILE, in phyſics, is commonly uſed to denote a mixed body whoſe integral parts are eaſily diſſipated by fire or heat; but is more properly uſed for bodies whoſe elements or firſt component parts are eaſily ſeparated from each other, and diſperſed in air. See CHEMISTRY.

VOLATILISATION, the act of rendering fixed bodies volatile, or of reſolving them by fire into a fine ſubtle vapour or ſpirit, which eaſily diſſipates and flies away. All bodies, even the moſt fixed, as gold, may be volatilized; either of themſelves, or with the admixture of ſome volatile ſubſtance, or ſpirit, by diſtillation or ſublimation.

VOLERY, a great bird-cage, ſo large that the birds have room to fly up and down in it.

VOLHINIA, or VOLONIA, a province of Poland, bounded by Poleſia, on the north; by the lower Volhinia, or Ukrain, in the territories of Ruſſia, on the eaſt; by Podolia, on the ſouth; and by the province of Red Ruſſia, on the weſt.

VOLITION, the act of willing. See METAPHYSICS.

VOLKAMERIA, in botany, a genus of the didynamia angioſpermia claſs. The calix conſiſts of five ſegments; and the berry contains two bilocular ſeeds. There are two ſpecies, none of them native of Britain

VOLLEY, a military ſalute, made by diſcharging a great number of fire-arms at the ſame time.

VOLO, in Roman antiquity, an appellation given to the ſlaves, who, during the ſecond Punic war, offered themſelves to ſerve in the army.

VOLT, in the manege, a round or circular tread; and hence by the phraſe, to make volts, is underſtood a gate of two treads, made by a horſe going ſideways round a center, in ſuch a manner, that theſe two treads make parallel tracts, one larger made by the fore-feet, and another ſmaller made by the hind-feet, the croup approaching towards the centre, and the ſhoulders bearing outwards.

VOLUME, in matters of literature, a book, or writing, of a juſt bulk to be bound by itſelf. The name is derived from the Latin *volvere*, to roll up; the ancient manner of making up books being in rolls of bark or parchment. See BOOK.

VOLUNTARY, in muſick, a piece played by a muſician extempore, according to his fancy. This is often uſed before he begins to ſet himſelf to play any particular compoſition, to try the inſtrument, and to lead him into the key of the piece he intends to perform.

VOLUNTEERS, in the military art, perſons who of their own accord, and at their own expence, ſerve in the army.

VOLUTA in natural hiſtory, a genus of inſects belonging to the order of vermes teſtacea. It is an animal of the ſnail kind, with an unilocular ſpiral ſhell, of which there are 46 ſpecies, diſtinguiſhed by peculiarities in their ſhells.

VOLUTE, in architecture, a kind of ſpiral ſcroll, uſed in the

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the Ionic and Compoſite capitals, whereof it makes the principal characteriſtic and ornament. See ARCHITECTURE, p. 352.

VOLVULUS, in medicine, a name which ſome authors give to the iliac paſſion. See MEDICINE, p. 114.

VOMIR, in anatomy. See ANATOMY, p. 163.

VOMICA, in medicine, is commonly taken for a ſuppurated impoſthume, or an abſceſs with a ſuppuration. See MEDICINE, p. 104.

Nux VOMICA, in pharmacy, a flat compreſſed round fruit, of the breadth of a ſhilling, or ſomewhat more, and of about the thickneſs of a crown-piece.

It is the nucleus of a fruit of an Eaſt-Indian tree, the wood of which is the lignum colubrinum of the ſhops.

Some have preſcribed ſmall doſes of the nux vomica as a ſpecific againſt a gonorrhœa, and others againſt quartan agues. But we have ſo many good and ſafe medicines for all theſe purpoſes, that there ſeems no occaſion for our having recourſe to ſuch as theſe, which ſhew ſo many ſigns of miſchief.

VOMIT, in pharmacy. See EMETIC.

VOMITING, in medicine, a retrograde ſpaſmodic motion of the muſcular fibres of the oeſophagus, ſtomach, and inteſtines, attended with ſtrong convulſions of the muſcles of the abdomen and diaphragm, which, when gentle, create a nauſea; when violent, a vomiting. See MEDICINE, p. 115.

VOORN, one of the iſlands of Holland, bounded by the river Maes, which divides it from the continent and the iſland of Iſſemunde, on the north; by the ſea called the Bies-boſch, on the eaſt; by another branch of the Maes, which divides it from the iſlands of Goree and Overflackee, on the ſouth; and by the German ſea, on the weſt; being about twenty-four miles long, and five broad.

VORTEX, in meteorology, a whirlwind, or ſudden, rapid, and violent motion of the air in gyres, or circles.

Vortex is alſo uſed for an eddy or whirlpool; or a body of water, in certain ſeas or rivers, which runs rapidly around, forming a ſort of cavity in the middle.

VORTEX, in the Carteſian philoſophy, is a ſyſtem or collection of particles of matter moving the ſame way, and round the ſame axis.

Such vortices are the grand machines, whereby thoſe philoſophers ſolve moſt of the motions and other phenomena of the heavenly bodies. Accordingly, the doctrine of theſe vortices make a great part of the Carteſian philoſophy.

VOTE, the ſuffrage or reſolve of each of the members of an aſſembly, where any affair is to be carried by a majority; but more particularly uſed for the reſolves of the members of either houſe of parliament.

VOTIVE MEDALS, thoſe on which are expreſſed the vows of the people for the emperors or empreſſes. See MEDAL.

VOW, a ſolemn and religious promiſe, or oath. See OATH.

The uſe of vows is found in moſt religions. They make up a conſiderable part of the pagan worſhip, being made either in conſequence of ſome deliverance, under ſome preſſing neceſſity, or for the ſucceſs of ſome enterprize. Among the Jews all vows were to be voluntary, and made by perſons wholly in their own power; and if ſuch perſon made a vow, in any thing lawful and poſſible, he was obliged to fulfil it. If he appointed no particular time for accompliſhing his vow, he was bound to do it inſtantly, leſt by delay he ſhould prove leſs able, or be unwilling, to execute his promiſe. Among the Romaniſts, a perſon is conſtituted a religious by taking three vows, that of poverty, chaſtity, and obedience.

VOWS, among the Romans, ſignified ſacrifices, offerings, preſents, and prayers made for the Cæſars and emperors, particularly for their proſperity and the continuance of their empire. Theſe were at firſt made every five years, then every fifteen, and afterwards every twenty, and were called quinquennalia, decennalia, and vincennalia.

VOWEL, in grammar, a letter which affords a complete ſound of itſelf, or a letter ſo ſimple as only to need a bare opening of the mouth to make it heard, and to form a diſtinct voice.

The vowels are ſix in number, *viz.* A, E, I, O, U, Y, and are called vowels, in contradiſtinction to certain other letters, which, depending on a particular application of ſome part of the mouth, as the teeth, lips or palate, can make no perfect ſound without an opening of the mouth, that is, without the addition of a vowel, and are therefore called conſonants.

UPHOLSTER, UPHOLSTERER, or UPHOLDER, a tradeſman that makes beds, and all ſorts of furniture thereunto belonging, *&c.*

UPLAND, denotes high ground, or, as ſome call it, terra firma, by which it ſtands oppoſed to ſuch as is mooriſh, marſhy, or low.

UPLAND, a province of Sweden, bounded by the province of Geſtricia on the north-weſt, by the Baltic ſea on the north-eaſt and ſouth-eaſt, and by Sunderland and Weſtmania on the ſouth and weſt.

UPPINGHAM, a market-town of England, in the county of Rutland, ſituated ſix miles ſouth of Okeham.

UPRIGHT, in heraldry, is uſed in reſpect of ſhell-fiſhes, as crevices, *&c.* when ſtanding erect in a coat. Inaſmuch as they want fins, they cannot, according to Guillim, be properly ſaid to be hauriant, that being a term appropriated to ſcaly fiſhes.

UPSAL, a city once the capital of the province of Upland, and of all Sweden, being the only archbiſhop's ſee in Scandinavia, and an univerſity; ſituated in E. long. 17° 30′, N. lat. 60°.

UPTON, a market-town of Worceſterſhire, nine miles ſouth of Worceſter.

UPUPA, in ornithology, a genus belonging to the order of picæ. The beak is arcuated, convex, and ſomewhat blunt; the tongue is obtuſe, entire, triangular, and very ſhort; and the feet are fitted for walking. There are two ſpecies, both natives of India.

URACHUS, a membranous canal in the fœtus of quadrupeds in general, of a pyramidal figure, extended immediately from the fundus of the bladder to the navel; and after paſſing through this, it is by degrees enlarged, and makes its way into the allantois at right-angles each way, or nearly ſo, and conveys the urine from the bladder into the cavity of this membrane.

URANBURG, or URANIBURG, a caſtle of Denmark, ſituated on the little iſland of Huen, in the Sound, ſixteen miles north-eaſt of Copenhagen. Here was the celebrated obſervatory built by that noble Dane Tycho Brahe, and furniſhed with inſtruments for obſerving the courſe and motions of the heavenly bodies.

URANO-

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URANOSCOPUS, in ichthyology, a genus belonging to the order of jugulares. The head is large, rough, and depreſſed, the upper jaw being ſhorter than the under one; there are five dentated rays in the membrane of the gills; and the anus is in the middle of the body. There is but one ſpecies, found in the Mediterranean ſea.

URBINO, a province of Italy, in the pope's territory, bounded by Romania and the gulph of Venice on the north and eaſt, by the marquiſate of Ancona on the ſouth, and by Tuſcany on the weſt, being ſeventy miles long, and from twenty to fifty broad.

Urbino is alſo the capital of this province.

URDE', or URDE'E, in heraldry. A croſs urdé ſeems to be the ſame with what we otherwiſe call chleche, or chlechée. See CHLECHE.

URENA, in botany, a genus of the monadelphia polyandria claſs. The calix is double, the exterior one conſiſting of five ſegments; the capſule has five cells containing one ſeed. There are three ſpecies, all natives of China.

URETERS, in anatomy. See ANATOMY, p. 268.

URETHRA, in anatomy. See ANATOMY, p. 272.

URGEL, a town of Spain, in the province of Catalonia, capital of the territory of Urgel, ſituated on the river Segra, ſeventy-five miles north of Barcelona.

URI, one of the cantons of Switzerland; bounded by that of Switz, on the north; by Glaris and the Griſons, on the eaſt; by Underwald, on the ſouth; and by the Canton of Bern, on the weſt.

URIM and THUMMIM, among the ancient Hebrews, a certain oracular mannner of conſulting God, which was done by the high prieſt dreſſed in his robes, and having on his pectoral or breaſt-plate.

Various have been the ſentiments of commentators concerning the urim and thummim. Joſephus, and ſeveral others, maintain, that it meant the precious ſtones ſet in the high-prieſt's breaſt-plate, which by extraordinary luſtre made known the will of God to thoſe who conſulted him. Spencer believes that the urim and thummim were two little golden figures ſhut up in the pectoral as in a purſe, which gave reſponſes with an articulate voice. In ſhort, there are as many opinions concerning the urim and thummim as there are particular authors that wrote about them. The ſafeſt opinion, according to Broughton, ſeems to be, that the words urim and thummim ſignify ſome divine virtue and power annexed to the breaſt-plate of the high prieſt, by which an oraculous anſwer was obtained from God when he was conſulted by the high-prieſt; and that this was called urim and thummim to expreſs the clearneſs and perfection which theſe oracular anſwers always carried with them; for urim ſignifies light, and thummim perfection; theſe anſwers not being imperfect and ambiguous, like the heathen oracles, but clear and evident. The uſe made of the urim and thummim was to conſult God in difficult caſes relating to the whole ſtate of Iſrael; and ſometimes in caſes relating to the king, the ſanhedrim, the general of the army, or ſome other great perſonage.

URINAL, in medicine, a veſſel fit to receive and hold urine, and uſed accordingly for the convenience of ſick perſons. It is uſually of glaſs, and crooked; and ſometimes it is filled with milk, to aſſwage the pain of the gravel.

URINAL, in chemiſtry, is an oblong glaſs veſſel, cloſed for making ſolutions, and ſo called from its reſemblance to the glaſſes in which urine is ſet to ſettle for the inſpection of the phyſician.

URINE, a ſerous and ſaline fluid, of a citron-colour, ſeparated from the blood, and carried by the emulgent arteries to the kidneys, from whence it deſcends to the bladder by the ureters, and is from time to time emitted thence by the canal of the urethra. See ANATOMY, p. 268. For the analyſis of urine, ſee CHEMISTRY, p. 177.

URN, a kind of vaſe, of a roundiſh form, but biggeſt in the middle, like the common pitchers, now ſeldom uſed but in the way of ornament over chimney-pieces, in buffets, &c. The great uſe of urns among the ancients, was to preſerve the aſhes of the dead after they were burnt; for which reaſon they were called cinerariæ, and runæ cinerariæ, and were placed ſometimes under the tomb-ſtone whereon the epitaph was cut; and ſometimes in vaults in their own houſes. Urns were alſo uſed at their ſacrifices to put liquid things in.

UROGALLUS, in ornithology. See TETRAO.

URSA, in aſtronomy. See ASTRONOMY, p. 487.

URSULINES, in church-hiſtory, an order of nuns, founded originally by St Angela of Breſcia, in the year fifteen hundred thirty ſeven, and ſo called from St Urſula, to whom they were dedicated. They obſerve the rules of St Auguſtine, and are chiefly noted for taking on them the education and inſtruction of young maids: their monaſteries are a kind of ſchools where young ladies of the beſt families receive their education.

URSUS, in zoology, a genus of quadrupeds belonging to the order of feræ. There are ſix foreteeth in the upper jaw alternately hallow on the inſide, and ſix in the under jaw, the two lateral ones being labated; the dog-teeth are ſolitary and conical; the grinders are five or ſix; the tongue is ſmooth; the eyes are furniſhed with a nictitating membrane; the noſe is prominent; and there is a crooked bone in the penis. There are four ſpecies, *viz.* 1. The arctas, or white bear, with an abrupt tail. He is a native of the northern parts of Europe, and feeds upon berries, inſects, and the bodies of dead cattle. He is naturally a lazy animal; but when enraged, he becomes agile and furious, ſtanding erect and fighting with his forefeet. When lying, he conſtantly licks his paws. The female admits the male about the end of October, and ſhe brings forth in 112 days. He never attacks a man, unleſs he be provoked. 2. The meles, has the tail of an uniform colour; the body is aſh-coloured above and black below, with a longitudinal black belt acroſs the eyes and ears. He is likewiſe a native of Europe, and dwells in woods and the clifts of rocks. He feeds upon eggs, inſects, the leaves of the lathynus, &c. In the night he preys upon rabbits, &c. and ſeldom appears in the day. He ſhuts himſelf up in a den dug in the earth during the winter, and ſucks a pellicle or bladder ſituate above the anus. 3. The lator, has an annular tail, and a black belt acroſs the eyes. He is found about the ſea ſhores of America. He feeds upon eggs, fowls ſnails, &c. 4. The luſcus, has a long tail; and the body is iron coloured. He is a native of Hudſon's bay.

URTICA, in botany, a genus of the monœcia tetrandria claſs. The calix of the male conſiſts of four leaves, and that

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that of the female of two valves; neither of them have any corolla; the male has a cup-ſhaped nectarium, and the female bears one ſmooth ſeed. The ſpecies are 18, three of them natives of Britain, *viz.* the pilaſera, or Roman nettle; the arens, or leſſer nettle; and the dioica, or common nettle.

USANCE, in commerce, is a determinate time fixed for the payment of bills of exchange, reckoned either from the day of the bills being accepted, or from the day of their date; and thus called becauſe regulated by the uſage and cuſtom of the places whereon they are drawn.

USE, in law, the profit or benefit of lands and tenements; or a truſt and confidence repoſed in a perſon for the holding of lands, *&c.* that he to whoſe uſe the truſt is made ſhall receive the profits.

USEDOM, an iſland of Pomerania, in Germany, ſituated at the mouth of the river Oder, in the Baltic ſea: ſubject to the king of Pruſſia.

USHANT, an iſland of France, fifteen miles weſt of the coaſt of Britany, at the entrance of the Britiſh channel.

USHER, an officer, or ſervant, who has the care and direction of the door of a court hall, chamber, or the like.

Usher *of the black rod*, the eldeſt of the gentlemen uſhers, daily waiters at court, whoſe duty is to bear the rod before the king at the feaſt of St George, and other ſolemnities.

USK, a river of Wales, which riſes on the weſt of Brecknockſhire, and runs ſouth eaſt through that country and Monmouthſhire, falling into the mouth of the Severn.

USQUEBAUGH, a ſtrong compound liquor, chiefly taken by way of dram.

There are ſeveral different methods of making this liquor; but the following is eſteemed one of the beſt: To two gallons of brandy, or other ſpirits, put a pound of Spaniſh-liquorice, half a pound of raiſins of the ſun, four ounces of currants, and three of ſliced dates; the tops of baum, mint, ſavory, thyme, and the tops of the flowers of roſemary, of each two ounces; cinnamon and mace, well bruiſed, nutmegs, aniſeeds, and coriander-ſeeds, bruiſed likewiſe, of each four ounces; of citron, or lemon, and orange-peel, ſcraped, of each an ounce: let all theſe infuſe forty-eight hours in a warm place, often ſhaking them together: then let them ſtand in a cool place for a week: after which the clear liquor is to be decanted off, and to it is to be put an equal quantity of neat white port, and a gallon of canary; after which it is to be ſweetened with a ſufficient quantity of double-refined ſugar.

USTION, in pharmacy, the preparing of certain ſubſtances by burning them.

USTULATION, a word uſed by pharmaceutic writers, to expreſs the roaſting or torrefying of humid or moiſt ſubſtances over a gentle fire, ſo as to render them fit for powdering.

USUCAPTION, in the civil law, is an acquiſition of the property of a thing, by a poſſeſſion and enjoyment thereof for a certain term of years preſcribed by law.

USUFRUIT, in the civil law, the uſe or enjoyment of any lands or tenements; or the right of receiving the fruits and profits of an inheritance, or other thing, without a power of alienating or changing the property thereof.

USURER, a perſon charged with a habit or act of uſury. See Usury.

USURIOUS contract, is any bargain or contract where by a man is obliged to pay more intereſt for money than the ſtatute allows.

USURPATION, in law, is an injurious uſing or enjoyment of a thing for continuance of time, that belongs of right to another.

USURY, in the general, denotes a gain or profit which a perſon makes of his money, by lending the ſame; or it is an increaſe of the principal, exacted for the loan thereof; or the price a borrower gives for the uſe of a ſum credited to him by the lender, called alſo intereſt.

The word uſury is generally taken in an evil ſenſe, *viz.* for an unlawful profit which a perſon makes of his money; in which ſenſe it is, that uſury is forbidden by the civil and eccleſiaſtical, and even by the law of nature. See Law, Tit. xxxiii. 37.

UTERINE, ſomething belonging to the uterus or womb of a woman.

Brother or *Siſter* Uterine, in Scots law. See Law, Tit. xxvii. 3.

UTERUS, in anatomy. See Anatomy, p. 274.

UTILE, a Latin term, ſignifying profitable or uſeful; in which ſenſe it is ſometimes uſed by Engliſh writers.

UTOXETER, a market-town of Staffordſhire, twelve miles ſouth-eaſt of Stafford.

UTRECHT, the capital of a province of the ſame name, in the united Netherlands, ſituated twenty three miles ſouth-eaſt of Amſterdam.

UTRICULARIA, in botany, a genus of the diandria monogynia claſs. The corolla is ringent and calcarated; the calix conſiſts of two equal leaves; and the capſule of one cell. There are five ſpecies, two of them natives of Britain, *viz.* the vulgaris, or common hooded milfoil; and the minor, or leſſer hooded milfoil.

UVA ursi, in botany. See Vaccinium.

UVEA, in anatomy. See Anatomy, p. 289.

VULCANO, or Volcano, in natural hiſtory, a burning mountain, or one that vomits forth fire, flame, aſhes, cinders, *&c.*

As to the cauſe of vulcanos, it is found by experience, that there are ſeveral inflammable bodies, which, being mixed together in due proportion, will kindle into flame by fermentation alone, without the help of any fiery particles. Thus M. Lemery having covered up in the earth about fifty pounds of a mixture, compoſed of equal parts of ſulphur and filings of iron tempered with water; after eight or nine hours time, the earth where it lay vomited up flames. From this experiment we ſee the true cauſe of the fire of Ætna, Veſuvius, and other burning mountains, which probably are made up of ſulphur and ſome other matter proper to ferment with it, and take fire.

VULGATE, a very ancient Latin tranſlation of the Bible, and the only one the church of Rome acknowledges authentic. See Bible.

VULNERARY, in medicine, an epithet given to remedies proper for the cure of wounds and ulcers.

VULPES, the Fox. See Canis.

VULTUR, a genus of birds belonging to the order of accipitres. The beak is ſtrait, and crooked at the point; the head has no feathers, on the forepart being only naked ſkin; and the tongue is bifid. There are eight ſpe-

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cies, diſtinguiſhed principally by their colour and ſituation of caruncles.

VULVA, in anatomy. See ANATOMY, p. 275.

UVULA, in anatomy. See ANATOMY, p. 303.

UVULARIA, in botany, a genus of the hexandria monogynia claſs. The corolla conſiſts of ſix ſtraight petals; the nectarii are little pits at the baſe of each petal; and the filaments are very ſhort. There are three ſpecies, none of them natives of Britain.

UXBRIDGE, a market-town of Middleſex, ſituated on the river Colne, fifteen miles weſt of London.

UZBECK, TARTARY, a large country of Aſia, bounded by Calmuc Tartary on the north, by Tibet on the eaſt, by India and Perſia on the ſouth, and by a great deſart, which ſeparates it from the Caſpian ſea, on the weſt.

W.

W A G

WAAG, a river of Hungary, which riſes in the Carpathian mountains, on the confines of Poland, and running firſt from eaſt to weſt, then turns ſouth, and paſſing by Leopoldſtadt, falls into the Danube, oppoſite to the iſland of Schut.

WAAL, a river of the United Netherlands, being one of the branches of the Rhine, which runs from eaſt to weſt, through the Betu, in the province of Guelderland, paſſing by Nimeguen, Tiel, Bommel, and Gorcum, and continuing its courſe eaſtward, unites its waters with the Maes, and, paſſing by Dort, falls into the German ſea below the Briel.

WADD, or WADDING, is a ſtopple of paper, hay, ſtraw, or the like, forced into a gun upon the powder, to keep it cloſe in the chamber; or to put up cloſe to the ſhot, to keep it from rolling out.

WADSET, in Scots law. See Law, Tit. xv. 1, *&c.*

WAFT. To waft a ſhip, is to convoy her ſafe, as men of war do merchant ſhips. To make a waft, is to hang out ſome coat, ſea-gown, or the like, on the main ſhrouds of the ſhip, as a ſignal for people to come aboard, and ſignifying that the ſhip is in great diſtreſs.

WAFERS, or *Sealing* WAFFERS, are made thus: take very fine flower, mix it with glair of eggs, iſinglaſs, and a little yeaſt; mingle the materials; beat them well together; ſpread the batter, being made thin with gum-water, on even tin plates; and dry them in a ſtove; then cut them out for uſe.

You may make them of what colour you pleaſe, by tinging the paſte with brazil or vermilion for red; indigo or verditer, *&c.* for blue; ſaffron, turmerics, or gambooge, *&c.* for yellow.

WAGGON, a wheel-carriage, of which there are various forms, accommodated to the different uſes they are intended for. The common waggon conſiſts of the ſhafts or rads, being the two pieces which the hind horſe bears up; the welds; the ſlotes, or croſs pieces, which hold the ſhafts together; the bolſter, being that part on which the fore wheels and the axle-tree turn in wheeling the waggon acroſs the road; the cheſt or body of the waggon, having the ſtaves or rails fixed thereon; the bales, or hoops, which compoſe the top; the tilt, the place covered with cloth, at the end of the waggon. See MECHANICS, p. 50.

W A L

WAGRIA, the eaſtern diviſion of the duchy of Holſtein, in the circle of Lower Saxony, in Germany, bounded by the Baltic ſea on the north, eaſt, and ſouth.

WAGTAIL, in ornithology. See MOTACILLA.

WAIF, in law, a term applied to ſuch goods as a thief having felonioufly ſtolen, on his being cloſely purſued are waved or left by the felon, which become forfeited to the king, or lord of the manor.

WAIGRATS STRAITS, ſituated between Nova Zembla and Ruſſia, through which the Dutch ſailed to the north, as high as 75°, in order to diſcover a north-eaſt paſſage to China and the Eaſt Indies.

WAINSCOT, in building, the timber-work that ſerves to line the walls of a room, being uſually made in pannels, and painted, to ſerve inſtead of hangings.

WAKE *of a ſhip*, is the ſmooth water aſtern when ſhe is under ſail: this ſhews the way ſhe has gone in the ſea, whereby the mariners judge what way ſhe makes.

WAKE, is the eve-feaſt of the dedication of churches, which is kept with feaſting and rural diverſions.

WAKEFIELD, a market-town in the weſt-riding of Yorkſhire, ſituated on the river Caulder, twenty-four miles ſouth-weſt of York.

Action of WAKENING, in Scots law. See Law, Tit. xxx. 26.

WALACHIA, a province of Turky in Europe, bounded by the Irongate mountains, which ſeparate it from Tranſilvania, on the north-weſt; by Moldavia, on the north-eaſt; by the river Danube, which ſeparates it from the province of Bulgaria, on the ſouth-eaſt; and the ſame river ſeparates it from the province of Servia on the ſouth-weſt. It is two hundred miles long, and one hundred broad.

WALCOURT, a town of the biſhopric of Liege, ſituated on the confines of Namur, eighty miles ſouth of Charleroy.

WALDEC, a town of Germany, in the circle of the Upper Rhine, and landgraviate of Heſſe Caſſel, twenty miles ſouth weſt of Heſſe Caſſel city.

WALDEN, a market-town of Eſſex, ſituated twenty-five miles north-weſt of Chelmsford.

WALE, or WALES, in a ſhip, thoſe outermoſt timbers in a ſhip's ſide, on which the ſailors ſet their feet in climbing up. They are reckoned from the water, and are called her firſt, ſecond, and third wale, or bend.

WALE-

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WALE-KNOT, a round knot or knob made with three ſtrands of a rope, ſo that it cannot ſlip, by which the tacks, top-ſail ſheets, and ſtoppers are made faſt, as alſo ſome other ropes.

WALE-REARED, on board a ſhip, a name the ſeamen give to a ſhip, which, after ſhe comes to her bearing, is built ſtrait up: this way of building, though it does not look well, nor is, as the ſeamen term it, ſhip-ſhapen; yet it has this advantage, that a ſhip is thereby more roomy within board, and becomes thereby a wholeſome ſhip at ſea, eſpecially if her bearing be well laid out.

WALES, a principality in the weſt of England, comprehending 12 counties, bounded by Cheſhire, Shropſhire, Herefordſhire, and Monmouthſhire, on the eaſt, and ſurrounded by the ſea called the Iriſh channel, on the north, weſt, and ſouth.

New WALES, the ſouth-weſt coaſt of Hudſon's Bay, in North America, ſo called; now poſſeſſed by the Engliſh Hudſon's-Bay company.

WALL, in architecture, the principal part of a building, as ſerving both to incloſe it, and ſupport the roof, floors, *&c.*

Walls are diſtinguiſhed into various kinds, from the matter whereof they conſiſt, as plaſtered or mud-walls, brick-walls, ſtone-walls, flint or boulder walls, and boarded walls. See ARCHITECTURE.

WALLINGFORD, a borough-town of Berkſhire, ſituated on the river Thames, twelve miles north of Reading.

WALLOONS, the inhabitants of a conſiderable part of the Spaniſh Netherlands, *viz.* thoſe of Artois, Hainault, Namur, Luxemburgh, and part of Flanders and Brabant.

The Walloon language is ſaid to have been that of the ancient Gauls or Celts.

WALRUS, in zoology. See PHOCA.

WALNUT-TREE, in botany. See JUGLANS.

WALSALL, a market-town of Staffordſhire, thirteen miles ſouth of Stafford.

WALSHAM, a market-town of Norfolk, eleven miles north of Norwich.

WALSINGHAM, a market-town of Norfolk, eighteen miles north-weſt of Norwich.

WALTHAM, a market town of Leiceſterſhire, ſixteen miles north-eaſt of Leiceſter.

WALTHERIA, in botany, a genus of the monadelphia pentandria claſs.

WAPENTAKE, (from the Saxon) the ſame with what we call a hundred, and more eſpecially uſed in the northern counties beyond the river Trent. There have been ſeveral conjectures as to the original of the word; one of which is, that anciently muſters were made of the armour and weapons of the inhabitants of every hundred; and from thoſe that could not find ſufficient pledges of their good abearing, their weapons were taken away, and given to others; whence, it is ſaid, this word is derived. See HUNDRED.

WAR, a conteſt or difference between princes, ſtates, or large bodies of people; which not being determined by the ordinary meaſures of equity and juſtice, is referred to the deciſion of the ſword

WARD, a word of divers ſignifications: thus, a ward in London, is a part of the city committed to the ſpecial charge of one of the aldermen of the city. There are twenty-ſix wards in London, which are as hundreds, and the pariſhes thereof as towns. A foreſt is alſo divided into wards, and ſo are moſt of our hoſpitals.

WARD-HOLDING, in Scots law. See LAW, Tit. xi. 1.

WARD-HOOK, or WADD-HOOK, in gunnery, a rod or ſtaff with an iron end turned ſerpent-wiſe, or like a ſcrew, to draw the wadding out of a gun when it is to be unloaded. See WADD.

WARDEN, or GUARDIAN, one who has the charge or keeping of any perſon, or thing, by office. See GUARDIAN.

Such is the warden of the fleet, the keeper of the fleet-priſon; who has the charge of the priſoners there, eſpecially ſuch as are committed from the court of chancery for contempt.

Church WARDENS. See CHURCH.

WARDHUYS, a port of Norwegian Lapland, 120 miles ſouth-eaſt of the north-cape: E. long. 28°, and N. lat. 71°.

WARDMOTE, in London, is a court ſo called, which is kept in every ward of the city, anſwering to the curiata comitia in ancient Rome.

WARDROBE, a cloſet, or little room adjoining to a bed-chamber, ſerving to diſpoſe and keep a perſon's apparel in; or, for a ſervant to lodge in, to be at hand to wait, *&c.*

Wardrobe, in a prince's court, is an apartment wherein his robes, wearing apparel, and other neceſſaries, are preſerved under the care and direction of proper officers; as the maſter of the wardrobe, clerk, *&c.* of the wardrobe.

WARE, a market-town of Hertfordſhire, under the meridian of London, and twenty miles north of that city.

WAREHAM, a borough of Dorſetſhire, ſeventeen miles eaſt of Dorcheſter.

WARMINSTER, a market-town of Wiltſhire, ſeventeen miles north-weſt of Saliſbury.

WARN, in law, is to ſummon a perſon to appear in a court of juſtice.

WARNING *of Tenants*, in Scots law. See LAW, Tit. xiii. 16.

WARP, in the manufactures, is the threads, whether of ſilk, wool, linen, hemp, *&c.* that are extended lengthwiſe on the weaver's loom; and a-croſs which the workman by means of his ſhuttle paſſes the threads of the woof, to form a cloth, ribband, fuſtian, or other matter.

WARRANDICE, in Scots law. See LAW, Tit. x. 11.

WARRANT, an act, inſtrument, or obligation, whereby a perſon authoriſes another to do ſomething which he otherwiſe had not a right to do.

WARRANTY, a promiſe or covenant by deed, made by the bargainer for himſelf and his heirs, to warrant and ſecure the bargainee and his heirs againſt all men for enjoying the thing agreed on between them.

WARREN, a franchiſe, or place privileged either by preſcription or grant from the king, to keep beaſts and fowl of warren in; as rabbits, hares, partridges, pheaſants, *&c.*

WARRINGTON, a market-town of Lancaſhire, ſeventeen miles eaſt of Liverpool.

WARSAW, the capital of Warſovia, and of the kingdom of Poland: E. long. 21° 5′, and N lat. 52° 15′.

WARSOVIA, a province of Poland, bounded by Pruſſia, on the north; by Polachia, on the eaſt; by the province of Little Poland, on the ſouth; and by that of Great Poland, on the weſt.

WART,

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WART, in ſurgery, a little round hard excreſcence ariſing from the fleſh like a pea.

WARWICK, the capital of Warwickſhire, ſituated on the river Avon, eighty miles north-weſt of London: W. long. 1° 32′, N. lat. 52° 20′

WASH, among diſtillers, the fermentable liquor uſed by the mal diſtillers See BREWERY.

WASHING, in painting, is when a deſign, drawn with a pen or crayon, has ſome one colour laid over it with a pencil, as Indian-ink, biſtre, or the like, to make it appear the more natural, by adding the ſhadow of prominences, aperture, *&c.* and by imitating the particular matters whereof the thing is ſuppoſed to conſiſt.

Thus they waſh with a pale red, to imitate brick and tile; with a pale Indian-blue, to imitate water and ſlate; with green, for trees and meadows; with ſaffron or French berries, for gold or braſs; and with ſeveral colours, for marbles.

WASHING *of Ores*, the purifying an ore of any metal, by means of water, from earths and ſtones, which would otherwiſe render it difficult of fuſion. See CHEMISTRY, p. 130.

WASP, in zoology. See VESPA.

WASTE *of a Ship*, is that part of her between the main and fore maſt.

WASTE-BOARDS, are boards ſometimes ſet upon the ſide of a boat, or other veſſel, to keep the ſea from breaking into her.

WATCH, in the art of war, a number of men poſted at any paſſage, or a company of the guards who go on the patrol.

WATCH and CLOCK WORK.

A CLOCK is a machine conſtructed in ſuch a manner, and regulated by ſuch uniform movements, as to meaſure time and all its ſubdiviſions with great exactneſs. The ſame definition comprehends watches of all kinds; and indeed they are both made upon the ſame principles. We ſhall therefore give a view of the conſtruction of both theſe machines under this article.

Of the Mechaniſm of CLOCKS, *and how they meaſure Time.*

THE firſt figure of Plate CLX is a profile of a clock; P is a weight ſuſpended by a rope that winds about the cylinder or barrel C, which is fixed upon the axis *a a*; the pivots *b b* go into holes made in the plates TS, TS, in which they turn freely. Theſe plates are made of braſs or iron, and are connected by means of *four pillars* Z Z; and the whole together is called the frame.

The weight P, if not reſtrained, would neceſſarily turn the barrel C with an uniform accelerated motion, in the ſame manner as if the weight was falling freely from a height. But the barrel is furniſhed with a ratchet wheel K K, the right ſide of whoſe teeth ſtrikes againſt the click, which is fixed with a ſcrew to the wheel D D, as repreſented in fig. 2. ſo that the action of the weight is communicated to the wheel D D, the teeth of which act upon the teeth of the ſmall wheel *d* which turns upon the pivots *c c*. This communication of the teeth of one wheel with another is called engrenage or pitching; and a ſmall wheel, like *d*, is called a pinion.

The wheel E E is fixed upon the axis of the pinion *d*; and the motion communicated to the wheel D D by the weight is tranſmitted to the pinion *d*, conſequently to the wheel E E, as likewiſe to the pinion *e*, and wheel F F, which moves the pinion *f*, upon the axis of which the crown or balance wheel G H is fixed. The pivots of the pinion *f* play in holes of the plates L M, which are fixed horizontally to the plates T S. In a word, the motion begun by the weight is tranſmitted from the wheel G H to the palettes I K, which communicates its motion by means of the fork U X riveted on the palettes, to the pendulum A B, which is ſuſpended upon the hook A. The pendulum A B deſcribes, round the point A, an arc of a circle alternately going and returning. If then the pendulum be once put in motion by a puſh of the hand, the weight of the pendulum at B will make it return upon itſelf, and it will continue to go alternately backward and forward till the reſiſtance of the air upon the pendulum, and the friction at the point of ſuſpenſion at A, deſtroys the original impreſſed force. But as, at every vibration of the pendulum, the teeth of the balance-wheel G H act ſo upon the palettes I K, (the pivots upon the axis of theſe palettes play in two holes of the potence *s t*,) that after one tooth H has communicated motion to the palette K, that tooth eſcapes; then the oppoſite tooth G acts upon the palette I, and eſcapes in the ſame manner; and thus each tooth of the wheel eſcapes the palettes I, K, after having communicated their motion to the palettes in ſuch a manner that the pendulum, inſtead of being ſtopt, continues to move.

The wheel E E revolves in an hour; the pivot *e* of this wheel paſſes through the plate, and is continued to *r*; upon the pivot is a wheel N N with a long ſocket faſtened in the centre; upon the extremity of this ſocket *r* the minute-hand is fixed. The wheel N N acts upon the wheel O; the pinion of which, *p*, acts upon the wheel *g g*, fixed upon a ſocket which turns along with the wheel N This wheel *g g* makes its revolution in 12 hours, upon the barrel of which the hour-hand is fixed.

From the above deſcription it is eaſy to ſee, 1. That the weight *p* turns all the wheels, and at the ſame time continues the motion of the pendulum 2. That the quickneſs of the motion of the wheels is determined by that of the pendulum. 3 That the wheels point out the parts of time divided by the uniform motion of the pendulum.

When the cord upon which the weight is ſuſpended is entirely run down from off the barrel, it is wound up again by means of a key, which goes on the ſquare end of the arbor at Q, by turning it in a contrary direction from that in which the weight deſcends. For this purpoſe, the inclined ſide of the teeth of the wheel R (fig. 2) removes the click C, ſo that the ratchet-wheel R turns while the wheel D is at reſt: But as ſoon as the cord is wound up, the click falls in between the teeth of the wheel D and the right ſide of the teeth again act upon the end of the click, which obliges the

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the wheel D to turn along with the barrel; and the ſpring A keeps the crank between the teeth of the ratchet-wheel R.

We ſhall now explain how time is meaſured by the motion of the pendulum; and how the wheel E, upon the axis of which the minute-hand is fixed, makes but one preciſe revolution in an hour. The vibrations of a pendulum are performed in a ſhorter or longer time in proportion to the length of the pendulum itſelf. A pendulum of 3 feet 8¼ French lines in length, makes 3600 vibrations in an hour; *i. e.* each vibration is performed in a ſecond of time, and for that reaſon it is called a *ſecond pendulum*. But a pendulum of 9 inches 2¼ French lines makes 7200 vibrations in an hour, or two vibrations in a ſecond of time, and is called a *half-ſecond pendulum*. Hence, in conſtructing a wheel whoſe revolution muſt be performed in a given time, the time of the vibrations of the pendulum which regulates its motion muſt be conſidered. Suppoſing, then, that the pendulum AB makes 7200 vibrations in an hour, let us conſider how the wheel E ſhall take up an hour in making one revolution. This entirely depends on the number of teeth in the wheels and pinions. If the balance-wheel conſiſts of 30 teeth, it will turn once in the time that the pendulum makes 60 vibrations: for at every turn of the wheel, the ſame tooth acts once on the palette I, and once on the palette K, which occaſions two ſeparate vibrations in the pendulum; and the wheel having 30 teeth, it occaſions twice 30, or 60 vibrations. Conſequently, this wheel muſt perform 120 revolutions in an hour; becauſe 60 vibrations, which it occaſions at every revolution, are contained 120 times in 7200, the number of vibrations performed by the pendulum in an hour. Now in order to determine the number of teeth for the wheels E F, and their pinions *e f*, it muſt be remarked, that one revolution of the wheel E muſt turn the pinion *e* as many times as the number of teeth in the pinion is contained in the number of teeth in the wheel. Thus, if the wheel E contains 72 teeth, and the pinion *e* 6, the pinion will make twelve revolutions in the time that the wheel makes one; for each tooth of the wheel drives forward a tooth of the pinion, and when the ſix teeth of the pinion are moved, a complete revolution is performed; but the wheel E has by that time only advanced ſix teeth, and has ſtill 66 to advance before its revolution be compleated, which will occaſion 11 more revolutions of the pinion. For the ſame reaſon, the wheel F having 60 teeth, and the pinion *f* 6, the pinion will make 10 revolutions while the wheel performs one. Now, the wheel F being turned by the pinion *e*, makes 12 revolutions for one of the wheel E; and the pinion *f* makes ten revolutions for one of the weel F; conſequently, the pinion *f* performs 10 times 12 or 120 revolutions in the time the wheel E performs one. But the wheel G, which is turned by the pinion *f*, occaſions 60 vibrations in the pendulum each time it turns round; conſequently the wheel G occaſions 60 times 120 or 7200 vibrations of the pendulum while the wheel E performs one revolution; but 7200 is the number of vibrations made by the pendulum in an hour, and conſequently the wheel E performs but one revolution in an hour; and ſo of the reſt.

From this reaſoning, it is eaſy to diſcover how a clock may be made to go for any length of time without being wound up: 1 By increaſing the number of teeth in the wheels. 2. By diminiſhing the number of teeth in the pinions. 3. By increaſing the length of the cord that ſuſpends the weight; and laſtly, by adding to the number of wheels and pinions. But, in proportion as the time is augmented, if the weight continues the ſame, the force which it communicates to the laſt wheel GH will be diminiſhed.

It only remains to take notice of the number of teeth in the wheels which turn the hour and minute hands.

The wheel E performs one revolution in an hour; the wheel NN, which is turned by the axis of the wheel E, muſt likewiſe make only one revolution in the ſame time; and the minute-hand is fixed to the barrel of this wheel. The wheel N has 30 teeth, and acts upon the wheel O, which has likewiſe 30 teeth, and the ſame diameter; conſequently the wheel O takes one hour to a revolution: now the wheel O carries the pinion *p*, which has ſix teeth, and which acts upon the wheel *qq* of 72 teeth; conſequently the pinion *p* makes 12 revolutions while the wheel *qq* makes one, and of courſe the wheel *qq* takes 12 hours to one revolution; and upon the barrel of this wheel the hour-hand is fixed. We ſhall conclude with remarking, that all that has been ſaid here concerning the revolutions of the wheels, *&c.* is equally applicable to watches as to clocks.

Of the Mechaniſm of a WATCH.

WATCHES, as well as clocks, are compoſed of wheels and pinions, and a regulator to direct the quickneſs or ſlowneſs of the wheels, and of a ſpring which communicates motion to the whole machine. But the regulator and ſpring of a watch are vaſtly inferior to the weight and pendulum of a clock, neither of which can be employed in watches. In place of a pendulum, therefore, we are obliged to uſe a balance (fig. 4.) to regulate the motion of a watch; and of a ſpring (fig. 6.) which ſerves in place of a weight, to give motion to the wheels and balance.

The wheels of a watch, like thoſe of a clock, are placed in a frame formed of two plates and four pillars. Fig. 3. repreſents the inſide of a watch, after the plate (fig. 5.) is taken off. A is the barrel which contains the ſpring (fig. 6.) the chain is rolled about the barrel, with one end of it fixed to the barrel A, and the other to the fuſee B.

When a watch is wound up, the chain which was upon the barrel winds about the fuſee, and by this means the ſpring is ſtretched; for the interior end of the ſpring is fixed by a hook to the immoveable axis, about which the barrel revolves; the exterior end of the ſpring is fixed to the inſide of the barrel, which turns upon an axis. It is therefore eaſy to perceive how the ſpring extends itſelf, and how its elaſticity forces the barrel to turn round, and conſequently obliges the chain which is upon the fuſee to unfold and turn the fuſee; the motion of the fuſee is communicated to the wheel CC; then, by means of the teeth, to the pinion *c*, which carries the wheel D; then to the pinion *d*, which carries the wheel E; then to the pinion *e*, which carries the wheel F; then to the pinion *f*, upon which is the balance-wheel G, whoſe pivot runs in the pieces A called a potance, and B called the follower, which are fixed on the plate, fig. 5. This plate, of which only a part is repreſented, is applied to that of (fig. 3.) in ſuch a manner, that the pivots of the wheels enter into holes made in the plate (fig. 3.) Thus the impreſſed force of the ſpring is communicated to the wheels; and the pinion *f*, being then connected to the wheel F, obliges it to turn. (fig. 7) This wheel acts upon the palettes of the verge 1, 2, (fig 4.) the axis of which carries the balance

HH, (fig. 4.) The pivot I, in the end of the verge, enters into the hole *c* in the potance A (fig. 5.) In this figure the palettes are repreſented; but the balance is on the other ſide of the plate, as may be ſeen in fig. 11. The pivot 3 of the balance enters into a hole of the cock BC, (fig 10) a perſpective view of which is repreſented in (fig. 12.) Thus the balance turns between the cock and the potance *c*, (fig. 5.) as in a kind of cage. The action of the balance-wheel upon the palettes 1, 2, (fig. 4.) is the ſame with what we have deſcribed with regard to the ſame wheel in the clock; *i. e.* in a watch the balance-wheel obliges the balance to vibrate backwards and forward like a pendulum. At each vibration of the balance a palette allows a tooth of the balance-wheel to eſcape, ſo that the quickneſs of the motion of the wheels is entirely determined by the quickneſs of the vibrations of the balance, and theſe vibrations of the balance and motion of the wheels are produced by the action of the ſpring.

But the quickneſs or ſlowneſs of the vibrations of the balance depend not ſolely upon the action of the great ſpring, but chiefly upon the action of the ſpring *a*, *b*, *c*, called the ſpiral ſpring, (fig. 14) ſituated under the balance H, and repreſented in perſpective (fig. 11.) The exterior end of the ſpiral is fixed to the pin *a*, (fig. 14.) This pin is applied near the plate in *a*, (fig. 11.) the interior end of the ſpiral is fixed by a peg to the centre of the balance. Hence if the balance is turned upon itſelf, the plates remaining immoveable, the ſpring will extend itſelf, and make the balance perform one revolution. Now, after the ſpiral is thus extended, if the balance be left to itſelf, the elaſticity of the ſpiral will bring back the balance, and in this manner the alternate vibrations of the balance are produced.

In fig. 7. all the wheels above deſcribed are repreſented in ſuch a manner, that you may eaſily perceive at firſt ſight how the motion is communicated from the barrel to the balance.

In fig. 8. are repreſented the wheels under the dial-plate by which the hands are moved. The pinion *a* is adjuſted to the force of the prolonged pivot of the wheel D, (fig. 7.) and is called a cannon pinion. This wheel revolves in an hour. The end of the axis of the pinion *a*, upon which the minute-hand is fixed, is ſquare; the pinion (fig. 8.) is indented into the wheel *b*, which is carried by the pinion *a*. Fig. 9. is a wheel fixed upon a barrel, into the cavity of which the pinion (*a*) enters, and upon which it turns freely. This wheel, (*d*) revolves in 12 hours, and carries along with it the hour-hand.

W A T

WATCHING, in medicine, is produced by too great a determination of the nervous fluid to the organs of the ſenſes; whereby theſe organs are prepared to receive, readily, any impreſſions from external objects, which they propagate to the brain, and furniſh the ſoul with divers occaſions of thinking. See MEDICINE, p. 157.

WATER, in phyſiology, a ſimple fluid, and liquid body, reputed the third of the four vulgar elements. See CHEMISTRY, p. 67. and HYDROSTATICS.

Holy-WATER, a water prepared every Sunday in the Romiſh church, with divers prayers, exorciſms, *&c.* uſed by the people to croſs themſelves withal at their entrance to and going out of church; and pretended to have the virtue of waſhing away venial ſins, driving away devils, preſerving from thunder, diſſolving charms, ſecuring from, or curing diſeaſes, *&c.* Many of the reformed take the uſe of holy water to have been borrowed from the luſtral water of the ancient Romans.

WATER ORDEAL, or TRIAL, among our anceſtors, was of two kinds, by hot and by cold water. Trial or purgation, by boiling or hot water, was a way of proving crimes, by immerging the body, or the arm, in hot water, with divers religious ceremonies. In the judgment by boiling water, the accuſed, or he who perſonated the accuſed, was obliged to put his naked arm into a caldron full of boiling water, and to draw out a ſtone thence placed at a greater or leſs depth, according to the quality of the crime. This done, the arm was wrapped up, and the judge ſet his ſeal on the cloth; and at the end of three days they returned to view it; when if it were found without any ſcald, the accuſed was declared innocent. The nobles or great perſonages purged themſelves thus by hot water, and the populace by cold water. The trial, or purgation, by cold water, was thus: After certain prayers and other ceremonies, the accuſed was ſwaddled or tied up all in a peſotoon or lump, and thus caſt into a river, lake, or veſſel of cold water; where if he ſunk, he was held criminal; if he floated, innocent.

In the Levitical law, we find mention made of water which ſerved to prove whether or no a woman was an adultereſs; the formula, as it was performed by the prieſt, may be ſeen in the fifth chapter of the book of Numbers.

WATER, among jewellers, is properly the colour or luſtre of diamonds and pearls. The term, though leſs properly, is ſometimes uſed for the hue or colour of other ſtones.

WATER-*Beetle*, in zoology. See DYTISCUS.

WATER-BORNE, in the ſea-language. A ſhip is ſaid to be water-borne, when ſhe is where there is no more water than will barely bear her from the ground; or when lying even with the ground, ſhe firſt begins to float or ſwim.

WATER-COLOURS, in painting, are ſuch colours as are only diluted and mixed up with gum-water, in contradiſtinction to oil-colours.

WATER-GANG, a channel cut to drain a place by carrying off a ſtream of water.

WATER-LINE *of a Ship*, a line which diſtinguiſhes that part of her under water from that above, when ſhe is duly laden.

WATER-MEN, are ſuch as row in boats, or ply on the river Thames, in the government of whom the lord-mayor of London, and court of aldermen there, had always great power. They ſtill have the appointing of their fares, the taking more than which makes them liable to a fine of 40s. and half a year's impriſonment.

WATER-SHOOT, a young ſprig which ſpringe out of the root or ſtock of a tree

WATER SHOT, in the ſea-language, a ſort of riding at anchor, when a ſhip is moored neither croſs the tide, nor right up and down, but quartering betwixt both.

WATER-TABLE, in architecture, a ſort of ledge left in ſtone

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Fig. 1.

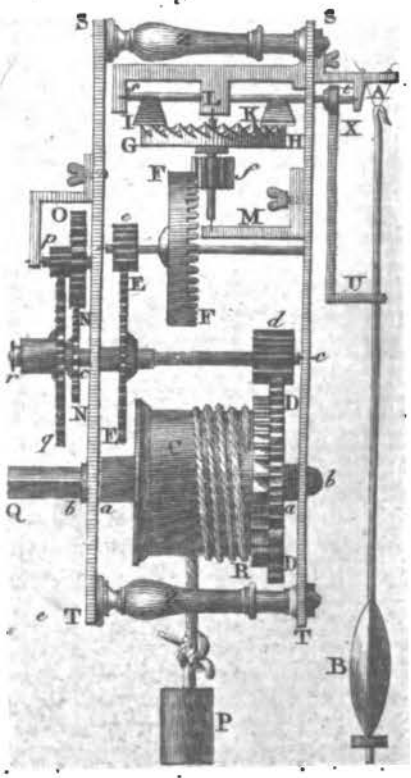

Fig. 2.

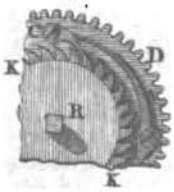

Fig. 3.

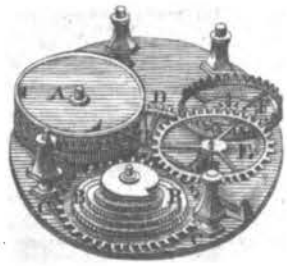

Fig. 4.

Fig. 5.

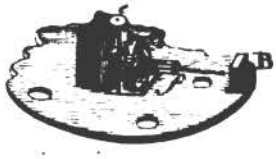

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

Fig. 15.

Fig. 16.

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ſtone or brick-walls, about eighteen or twenty inches from the ground, from which place the thickneſs of the wall begins to abate.

WATER-WAY, in a ſhip, is a ſmall ledge of timber, lying fore and aft on the deck, cloſe by her ſides, to keep the water from running down there.

WATER-WORKS, in general, denote all manner of machines moved by, or employed in raiſing or ſuſtaining water; in which ſenſe, water-mills of all kinds, ſluices, aqueducts, &c. may be called water-works. See HYDROSTATICS.

WATERFORD, a port-town of Ireland, capital of the county of Waterford, ſituated on the river Sure, eight miles north of the ſea: W. long. 7°, N. lat. 52° 12'.

It is one of the largeſt cities in Ireland, and has a good foreign trade.

WATERING, in the manufactures, is to give a luſtre to ſtuffs, &c. by wetting them lightly with gum-water, and then paſſing them through the preſs, or calender, whether hot or cold.

The gum-water ought to be pure, thin, and clear, otherwiſe the folds of the ſtuff will ſtick together: the operation muſt alſo be performed when the water is very hot, that it may penetrate.

WATLINGTON, a market-town of Oxfordſhire, ſituated twelve miles ſouth-eaſt of Oxford.

WATTON, a market-town of Norfolk, ſixteen miles ſouth-weſt of Norwich.

WAVE, in philoſophy, a cavity in the ſurface of water, or other fluid, with an elevation aſide thereof.

The waves of the ſea are of two kinds, natural and accidental. The natural waves are thoſe which are exactly proportioned in ſize to the ſtrength of the wind, whoſe blowing gives origin to them. The accidental waves are thoſe occaſioned by the wind's re-acting upon itſelf by repercuſſion from hills and mountains, or high ſhores, and by the waſhing of the waves themſelves, otherwiſe of the natural kind, againſt rocks and ſhoals: all theſe caſes give the waves an elevation, which they can never have in their natural ſtate.

Mr. Boyle has proved, by numerous experiments, that the moſt violent wind never penetrates deeper than ſix feet into the water; and it ſhould ſeem a natural conſequence of this, that the water moved by it can only be elevated to the ſame height of ſix feet from the level of the ſurface in a calm: and this ſix feet of elevation being added to the ſix of excavation, in the part whence that water ſo elevated was raiſed, ſhould give twelve feet for the utmoſt elevation of a wave. This is a calculation that does great honour to its author; for count Marſigli meaſured carefully the elevation of the waves near Provence, and found, that, in a very violent tempeſt, they aroſe only to ſeven feet above the natural level of the ſea, and this additional foot in height he eaſily reſolved into the accidental ſhocks of the water againſt the bottom, which was, in the place he meaſured them in, not ſo deep as to be out of the way of affecting the waves; and he allows that the addition of one ſixth of the height of a wave, from ſuch a diſturbance from the bottom, is a very moderate alteration from what would have been its height in a deep ſea; and concludes, that Mr. Boyle's calculation holds perfectly right in deep ſeas, where the waves are purely natural, and have no accidental cauſes to render them larger than their juſt proportion. In deep water, under the high ſhores of the ſame part of France, this author found the natural elevation of the waves to be only five feet; but he found alſo, that their breaking againſt rocks, and other accidents to which they were liable in this place, often raiſed them to eight feet high.

We are not to ſuppoſe, from this calculation, that no wave of the ſea can riſe more than ſix feet above its natural level in open and deep water; for waves immenſely higher than theſe are formed, in violent tempeſts, in the great ſeas. Theſe, however, are not to be accounted waves in their natural ſtate; but they are ſingle waves formed of many others: for in theſe wide plains of water, when one wave is raiſed by the wind, and would elevate itſelf up to the exact height of ſix feet, and no more, the motion of the water is ſo great, and the ſucceſſion of the waves ſo quick, that, during the time this is riſing, it receives into it ſeveral other waves, each of which would have been at the ſame height with itſelf; theſe run into the firſt wave, one after another, as it is riſing; by this means its riſe is continued much longer than it naturally would have been, and it becomes terribly great. A number of theſe complex waves ariſing together, and being continued in a long ſucceſſion by the continuation of the ſtorm, make the waves ſo dangerous to ſhips, which the ſailors in their phraſe call mountains-high.

WAVE-OFFERING, in Jewiſh antiquity, a ſacrifice offered by agitation, or waving, towards the four cardinal points of the compaſs.

WAVED, in heraldry, is ſaid of a bordure, or any ordinary, or charge, in a coat of arms, having its outlines indented in manner of the riſing and falling of waves: it is uſed to denote, that the firſt of the family in whoſe arms it ſtands, acquired its honours for ſea-ſervice.

WAVING, in the ſea-language, is the making ſigns to a veſſel to come near or keep off.

WAX, or *Bees*-WAX, in natural hiſtory, a firm and ſolid ſubſtance, moderately heavy, and of a fine yellow colour, formed by the bees from the farina of flowers. See APIS.

The beſt ſort is that of a lively yellow colour, and an agreeable ſmell, ſomewhat like that of honey: when new, it is toughiſh, yet eaſy to break; but by age it becomes harder and more brittle, loſes its fine colour, and in a great meaſure its ſmell.

From the common yellow wax, by the mere effect of ſun and air, or by what is called bleaching, is formed what we term white-wax, and ſome, very improperly, virgin-wax. The greater the ſurface is in proportion to the quantity, the ſooner and more perfectly this operation is performed. The uſual way is to melt the wax in hot water; when melted, they preſs it through a ſtrainer of tolerable fine linen, and pour it into round and very ſhallow moulds. When hardened by cooling, it is taken out and expoſed to the ſun and air, ſprinkling it now and then with water, and often turning it: by this means it ſoon becomes white. The beſt ſort is of a clear and almoſt tranſparent whiteneſs, dry, hard, brittle, and of an agreeable ſmell, like that of the yellow wax, but much weaker.

The common yellow wax is of very great uſe both in medicine and in many of the arts and manufactures. It is ſometimes given internally, as in dyſenteries, and other eroſions

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eroſions of the inteſtines; but its great uſe is in the making ointments and plaſters for external uſe, and the greater part of thoſe of the ſhops owe their conſiſtence to it. The white-wax is alſo an ingredient in ſome of the cerates and ointments of the ſhops; and is uſed in making candles, and in many of the nicer arts and manufactures, where WAX is required.

Sealing-WAX is made in the following manner: Take one pound of bees wax; three ounces of fine turpentine; olive-oil, and roſin, finely powdered, of each one ounce: when they are well melted, and the droſs taken off, put in an ounce and a half of vermilion, or red-lead, finely ground, and ſtir them together till they are well incorporated: and when this mixture grows a little cool, roll it into ſticks, or in any other form. If you would have it black, inſtead of vermilion, or red-lead, put in lamp-black. The ſoft, red, and green-wax, uſed in large ſeals to ſome of our law-writings, are thus made: Melt bees-wax over a gentle heat, with ſuch a proportion of Venice turpentine as, when cold, will give it the due conſiſtence: this is determined by repeated trials, firſt putting in but little turpentine, and afterwards more and more, till by dropping a piece upon a marble to cool, it is found of the true conſiſtence. They then colour it with red-lead, or vermilion, or with verditer, or whatever colours they pleaſe, the mixture in this ſtate receiving any.

WAX WORK, the repreſentation of the faces, *&c.* of perſons living or dead; made by applying plaſter of Paris in a kind of paſte, and thus forming a mould containing the exact repreſentation of the features. Into this mould melted wax is poured, and thus a kind of maſks are formed; which being painted and ſet with glaſs eyes, and the figures dreſſed in their proper habits, they bear ſuch a reſemblance that it is difficult to diſtinguiſh between the copy and the original.

WAY, a paſſage or road.

The Roman ways are divided into conſular, prætorian, military, and public; and of theſe we have four remarkable ones in England: the firſt, Watling-ſtreet, or Watheling-ſtreet, leading from Dover to London, Dunſtable, Touceſter, Atterſton, and the Severn, extending as far as Angleſea in Wales. The ſecond, called Hikenild, or Ikenild-ſtreet, ſtretches from Southampton over the river Iſis at Newbridge; thence by Camden and Litchfield; then paſſes the Derwent, near Derby, and ends at Tinmouth. The third, called Foſſe-way, becauſe in ſome places it was never perfected, but lies as a large ditch, leads from Cornwal through Devonſhire, by Tethbury, near Stow in the Wolds; and beſide Coventry to Leiceſter, Newark, and ſo to Lincoln. The fourth, called Erming, or Erminage-ſtreet, extends from St. David's, in Wales, to Southampton.

WAY *of a ſhip*, is ſometimes the ſame as her rake, or run forward or backward: but this term is moſt commonly underſtood of her ſailing.

WAY-WODE a title given to the governors of the chief places in the empire of Muſcovy, as alſo in Poland.

WEAR or WEER, a great ſtank or dam in a river, fitted for the taking of fiſh, or for conveying the ſtream to a mill.

New wears are not to be made, or others altered, to the nuſance of the public, under a certain penalty.

WEASEL, in zoology. See MUSTELA.

WEATHER, the ſtate or diſpoſition of the atmoſphere with regard to heat, cold, wind, rain, froſt, *&c.*

As it is in the atmoſphere that all plants and animals live, and as that appears to be the great principle of moſt animal and vegetable productions, alterations, *&c.* there does not ſeem any thing, in all philoſophy, of more immediate concernment to us than the ſtate of the weather, and a knowledge of the great influence it has on our bodies. What vaſt, but regular, alterations a little turn of weather makes in a tube filled with mercury, or ſpirits of wine, or in a piece of ſtring, *&c.* every body knows, in the common inſtance of barometers, thermometers, *&c.* and it is owing partly to our inattention, and partly to our unequal and intemperate courſe of living, that we do not feel as great and regular ones in the tubes, chords, and fibres of our own bodies.

WEATHER-COCK, a moveable vane in form of a cock, or other ſhape, placed on high, to be turned round according to the direction of the wind, and point out what quarter the wind blows from,

WEATHER-GLASSES. See BAROMETER, and THERMOMETER.

WEATHERING, among ſailors, ſignifies the doubling, or ſailing by a head-land, or other place.

WEAVING, the art of working a web of cloth, ſilk, or other ſtuff, in a loom with a ſhuttle. For the manner of performing which, ſee CLOTH.

WEB, a ſort of tiſſue or texture formed of threads interwoven with each other; ſome whereof are extended in length, and called the warp; and others drawn acroſs, and called the woof. See CLOTH.

Spider's WEB. See ARANEA.

WEDGE, one of the mechanical powers. See MECHANICS.

WEDNESDAY, the fourth day of the week, ſo called from a Saxon idol named Woden, ſuppoſed to be Mars, worſhipped on this day.

Aſh-WEDNESDAY, the firſt day of Lent, ſo called from the cuſtom obſerved in the ancient chriſtian church of penitents expreſſing their humiliation at this time, by appearing in ſackcloth and aſhes.

WEED, a common name for all rank and wild herbs, that grow of themſelves, to the detriment of other uſeful herbs they grow among.

WEED, in the miners language, denotes the degeneracy of a load or vein of fine metal into an uſeleſs marcaſite.

WEEK, in chronology, a diviſion of time comprifing ſeven days. See ASTRONOMY, p. 489.

The origin of this diviſion of weeks, or of computing time by ſevenths, is greatly controverted. Some will have it to take its riſe from the four quarters or intervals of the moon, between her changes or phaſes, which, being about ſeven days diſtant, gave occaſion to the diviſion.

Be this as it will, the diviſion is certainly very ancient. The Syrians, Egyptians, and moſt of the oriental nations, appear to have uſed it from all antiquity: though it did not get footing in the weſt till Chriſtianity brought it in: the Romans reckoned their days not by ſevenths, but by ninths, and the ancient Greeks by decads or tenths.

Indeed, the Jews divided their time by weeks, but it was upon a different principle from the eaſtern nations.

God

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God himſelf appointing them to work ſix days, and to reſt the ſabbath, in order to keep up the ſenſe and remembrance of the creation; which being effected in ſix days, he reſted the ſeventh.

Paſſion WEEK, or the *Holy* WEEK, is the laſt week in Lent, wherein the church celebrates the myſtery of our Saviour's death and paſſion.

WEEK, or WYCK, in geography, a parliament and port-town of Scotland, in the ſhire of Cathneſs: W. long. 2° 45′. N. lat. 58° 40′.

WEEVER, in ichthyology. See TRACHINUS.

WEIGH a weight of cheeſe, wool, *&c.* containing 256 pounds avoirdupoiſe. Of corn, the weigh contains forty buſhels; of barley or malt, ſix quarters. In ſome places, as Eſſex, the weigh of cheeſe is 300 pounds.

WEIGHING, the act of examining a body in the balance to find its weight.

WEIGHING-ANCHOR, is the drawing it out of the ground it had been caſt into, in order to ſet ſail, or quit a port, road, or the like.

WEIGHT, in phyſics, a quality in natural bodies whereby they tend downwards, towards the centre of the earth. Or, weight may be defined, in a leſs limited manner, to be a power inherent in all bodies whereby they tend to ſome common point, called the centre of gravity; and that with a greater or leſs velocity, as they are more or leſs denſe, or as the medium they paſs thro' is more or leſs rare. See MECHANICS.

WEIGHT, in commerce, denotes a body of a known weight, appointed to be put in the balance againſt other bodies whoſe weight is required.

WEIL, or WEYL, an imperial city of Germany, in the circle of Swabia, and duchy of Wirtemburg: E. long. 8° 40′, N. lat. 48° 40′.

WEIMAR, a city of Germany, in the circle of Upper Saxony, the capital of the Weimar: E. long. 11° 25′, N. lat. 51°.

WEISEL, a river of Poland, and the ſame with the viſtula. See VISTULA.

WEISSENBURG, or STULWEISSENBURG, a city of Lower Hungary, ſituated near the eaſt end of the Platten ſea, thirty-ſix miles ſouth-weſt of Buda.

WEISSENFELD, a town of Germany, in the circle of Upper Saxony, and marquiſate of Miſnia, ſeventeen miles ſouth-weſt of Leipſick.

WELCHPOLE, a market-town of Montgomeryſhire, ſituated ſix miles north of Montgomery.

WELD, or WOLD, in botany. See RESEDA.

WELDING HEAT, in ſmithery, a degree of heat given to iron, *&c.* ſufficient only for bending, or doubling it up.

WELL, a hole under ground, uſually of a cylindrical figure, and walled with ſtone and mortar: its uſe is to collect the water of the ſtrata around it.

WELL, in the military art, a depth which the miner ſinks under ground, with branches or galleries running out from it; either to prepare a mine, or to diſcover and diſappoint the enemies mine.

WELL HOLE, in building, is the hole left in a floor for the ſtairs to come up through.

WELLS, a city of Somerſetſhire, ſituated ſixteen miles ſouth weſt of the city of Bath, both which cities have but one biſhop.

This is alſo the name of a town of Germany, in the circle of Auſtria, ſituated eleven miles ſouth of Linez.

WELLAND, a river which riſing in Leiceſterſhire, and running eaſtward between the counties of Rutland and Northampton, and afterwards north-eaſt by Stamford, falls into a bay of the German Sea, which divides the counties of Lincoln and Norfolk.

WELLINBOROUGH, a market-town of Northamptonſhire, ſituated on the river Nen, ten miles north-eaſt of Northampton.

WELLINGTON, a market-town of Shropſhire, ſituated ten miles eaſt of Shrewſbury.

WEM, a market-town of Shropſhire, ſituated eight miles north of Shrewſbury.

WEN, a tumour or excreſcence that ariſes on different parts of the body, and contains a cyſtus or bag filled with ſome peculiar matter.

WENDOVER, a borough town of Bucks, ſix miles ſouth of Ailesbury; which ſends two members to parliament.

WENER, a lake in Sweden, in the province of Gothland, ſeventy miles in length, and fifty in breadth.

WENLOCK, a borough-town of Shropſhire, ten miles ſouth eaſt of Shrewſbury; which ſends two members to parliament.

WENSUSSEL, the north diviſion of Jutland, in Denmark, having the Categate ſea on the north, the Schaggerrack ſea on the eaſt, the province of Wiburg on the ſouth, and the German Sea on the weſt.

WEOBLEY, a borough-town of Herefordſhire; 12 miles north-weſt of Hereford; which ſends two members to parliament.

WERMELAND, a province of Sweden, lying between the province of Dalecarlia on the north, and the lake Wener on the ſouth.

WESEL, a city of Germany, in the duchy of Cleves: E. long. 6° 5′, N. lat. 51° 37′.

WESER, a river of Germany, which riſes in the Landgravate of Heſſe, runs between the circles of Weſtphalia and Lower Saxony, and falls into the German ſea below Carlſtat.

WEST, one of the cardinal points of the horizon, diametrically oppoſite to the eaſt; and ſtrictly defined, the interſection of the prime vertical with the horizon, on that ſide the ſun ſets in.

WESTRURY, a borough-town of Wiltſhire, twenty miles north-weſt of Saliſbury; which ſends two members to parliament.

WESTLOW, a borough town of Cornwal, twenty-three miles ſouth-weſt of Launceſton; which ſends two members to parliament

WESTMANIA, a province of Sweden, having Upland on the eaſt, and Wermeland on the weſt.

WESTMEATH, a county of Ireland, in the province of Leinſter, bounded by Longford and Cavan on the north; by Eaſtmeath, on the eaſt; by King's County, on the ſouth; and by the river Shannon, which divides it from Roſcommon, on the weſt

WESTMINSTER, a city which forms the weſt part of the town which goes by the general name of London; but is under a diſtinct government; the dean and chapter appointing the high ſteward, high bailiff, and other officers, who have the government of the city. Here are the king's palaces, and the houſes of moſt of the no-

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bility, the high court of parliament, and the ſupreme courts of juſtice; but there is no biſhop of this city It elects two members of parliament.

WESTMORELAND, an Engliſh county, bounded by Cumberland on the north, by Yorkſhire on the eaſt, by Lancaſhire on the ſouth, and by the Iriſh channel on the weſt.

WESTPHALIA, the north weſt circle of the empire of Germany; bounded by the German ocean, on the north; by the circle of Lower Saxony, on the eaſt; by the Landgravate of Heſſe, the Palatinate of the Rhine, and the electorate of Triers, on the ſouth; and by the Netherlands, on the weſt: being 200 miles in length, and from 150 to 200 in breadth.

WESTRAM, a market town of Kent, under the meridian of London, 44 miles weſt of Canterbury.

WETTERAVIA, the ſouthern diviſion of the Landgravate of Heſſe, in Germany, lying along the northern bank of the river Maine, comprehending the counties of Hanau and Naſſau.

WETZLAR, an imperial city of Germany, in the circle of the Upper Rhine and territory of Wetteravia ſituated on the river Lohn, E. long 8° 15′, N lat 50° 30′.

WEXFORD, a county of Ireland in the province of Munſter, bounded by the county of Wicklow on the north, by the ocean on the eaſt and ſouth, and by Kilkenny and Waterford on the weſt.

Wexford, the capital of this county, is ſituated at the mouth of the river Slaney, ſixty-five miles ſouth of Dublin.

WEYMOUTH, a port-town of Dorſetſhire, ſituated on a fine bay of the Engliſh channel. ſeven miles ſouth of Dorcheſter. It ſends two members to parliament.

WHALE, in ichthyology. See BALÆNA, and PHYSETER

WHARF, a ſpace on the banks of a haven, creek, or hithe, provided for the convenient loading and unloading of veſſels upon.

WHEAT, in botany. See TRITICUM. For the culture of wheat, ſee AGRICULTURE, p 60.

WHEEL, in mechanics, a ſimple machine, conſiſting of a round piece of wood, metal, or other matter, which revolves on an axis. See MECHANICS.

WHELP, the young of a dog, fox, lion, or any wild beaſt.

WHELPS, in a ſhip, the ſeaman's term for thoſe brackets which are ſet up on the capſtan cloſe under the bars; they give the ſweep to it, and are ſo contrived that the cable winding about them may not ſurge ſo much as it might otherwiſe do if the body of the capſtan were quite round and ſmooth.

WHETSTONE, a ſtone which ſerves for the whetting of knives and other tools upon.

WHEY, the ſerum, or watery part, of milk. See WHEY.

WHIG, a party in Britain, oppoſite to the tories, from whom they differ chiefly in their political principles. See TORIES.

The names of whig and tory were not known till about the middle of the reign of Charles II. when theſe were given as party-diſtinctions. Theſe parties may be conſidered either with regard to the ſtate, or to religion. The ſtate tories are either violent, or moderate: the firſt would have the king to be abſolute, and therefore plead for paſſive obedience, non-reſiſtance, and the hereditary right of the houſe of Steuart. The moderate tories would not ſuffer the king to loſe any of his prerogative; but then they would not ſacrifice thoſe of the people. The ſtate whigs are either ſtrong republicans, or moderate ones The firſt, ſays Rapin, are the remains of the party of the long parliament, who attempted to change monarchy to a commonwealth: but theſe make ſo ſlender a figure, that they only ſerve to ſtrengthen the party of the other whigs. The tories would perſuade the world, that all the whigs are of this kind; as the whigs would make us believe that all the tories are violent. The moderate ſtate whigs are much in the ſame ſentiments with the moderate tories, and deſire that the government may be maintained on the ancient foundation: all the difference is, that the firſt bear a little more to the parliament and people, and the latter to that of the king. In ſhort, the old whigs were always jealous of the encroachments of the royal prerogative, and watchful over the preſervation of the liberties and properties of the people.

WHIP or WHIP-STAFF, in a ſhip, a piece of timber, in form of a ſtrong ſtaff, faſtened into the helm, for the ſteerſman, in ſmall ſhips, to hold in his hand, in order to move the rudder and direct the ſhip.

WHIRLPOOL, an eddy, vortex, or gulph, where the water is continually turning round.

Theſe in rivers are very common, from various accidents, and are uſually very trivial, and of little conſequence. In the ſea they are more rare, but more dangerous. Sibbald has related the effects of a very remarkable marine whirlpool among the Orcades, which would prove very dangerous to ſtrangers, though it is of no conſequence to the people who are uſed to it. This is not fixed to any particular place, but appears in various parts of the limits of the ſea among thoſe iſlands. Wherever it appears, it is very furious; and boats, &c. would inevitably be drawn in and periſh with it; but the people who navigate them are prepared for it, and always carry an empty veſſel, a log of wood, or large bundle of ſtraw, or ſome ſuch thing, in the boat with them; as ſoon as they perceive the whirlpool they toſs this within its vortex, keeping themſelves out: this ſubſtance, whatever it be, is immediately received into the centre, and carried under water; and as ſoon as this is done, the ſurface of the place where the whirlpool was becomes ſmooth, and they row over it with ſafety; and in about an hour they ſee the vortex begin again in ſome other place uſually at about a mile's diſtance from the firſt.

WHIRLWIND a wind that riſes ſuddenly, is exceeding rapid and impetuous when riſen, but is ſoon ſpent. See PNEUMATICS, p. 495.

WHISPERING. See the articles HEARING, ATTENTION, &c.

WHISPERING PLACES depend upon this principle. If the vibrations of the tremulous body are propagated through a long tube, they will be continually reverberated from the ſides of the tube into its axis, and by that means prevented from ſpreading, till they get out of it; whereby they will be exceedingly increaſed, and the ſound rendered much louder than it would otherwiſe be.

Hence it is that ſound is conveyed from one ſide of a whiſpering gallery to the oppoſite one, without being perceived by thoſe who ſtand in the middle.

WHIST,

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WHIST, a well-known game at cards; ſo called from the ſilence obſerved during the play.

WHITBY, a port-town of the north riding of Yorkſhire, ſituated on the German ſea, thirty eight miles north-eaſt of York.

WHITCHURCH, a borough-town of Hampſhire, ſituated ten miles north of Wincheſter. It ſends two members to parliament.

WHITE, one of the colours of natural bodies.

WHITE *of the eye*, denotes the firſt tunic or coat of the eye, called albuginea. See ANATOMY, p. 289.

WHITE FRIERS, a name common to ſeveral orders of monks, from their being clothed in a white habit.

WHITE-HORSE, in ichthyology. See RAIA.

WHITE-LEAD. See CERUSE.

WHITE-SEA, in geography, a bay of the frozen ocean, in the north of Muſcovy, between Ruſſian Lapland and Samoieda.

WHITE WINE, wine of a bright tranſparent colour, bordering on white, thus called to diſtinguiſh it from the red wines See WINE.

WHITEHAVEN, a port-town of Cumberland, ſituated on the Iriſh channel: W. long. 3° 16′, N. lat. 54° 30′.

WHITENESS, the quality which denominates a body white.

WHITING, in ichthyology. See GADUS.

WHITES, in medicine, the ſame with fluor albus. See MEDICINE, p. 164.

WHITSUNDAY, a ſolemn feſtival of the Chriſtian church, obſerved on the fiftieth day after Eaſter, in memory of the deſcent of the Holy Ghoſt upon the apoſtles in the viſible appearance of fiery cloven tongues, and of thoſe miraculous powers which were then conferred upon them.

It is called Whitſunday, or White Sunday, becauſe this being one of the ſtated times for baptiſm in the ancient church, thoſe who were baptiſed put on white garments, as types of that ſpiritual purity they received in baptiſm As the deſcent of the Holy Ghoſt upon the apoſtles happened upon the day which the Jews called pentecoſt, this feſtival retained the name of pentecoſt among the Chriſtians

WIBURG, the capital of the territory of the ſame name in Jutland: E long. 9° 16′, N. lat 56° 20′.

WIBURG, a city and port-town of Ruſſian Finland, ſituated on the gulph of Finland: E long. 29°, N lat 61°.

WICCOMB CHIPPING, a borough-town of Bucks, twelve miles ſouth of Aileſbury. It ſends two members to parliament.

WICK DE DUERSTEDE, a town of the United Netherlands, in the province of Utrecht, fifteen miles ſouth eaſt of the city of Utrecht.

WICKER, a twig of the oſier ſhrub, ſingle or wrought.

WICKET, a ſmall door in the gate of a fortified place, *&c.* or a hole in a door, through which to view what paſſes without.

WICKLIFFISTS, or WICKLIFFITES, a religious ſect which ſprung up in England in the reign of Edward III. and took its name from John Wickliff, doctor and profeſſor of divinity in the univerſity of Oxford, who maintained that the ſubſtance of the ſacramental bread and wine remained unaltered after conſecration; and oppoſed the doctrine of purgatory, indulgences, auricular confeſſion, the invocation of ſaints, and the worſhip of images. He maintained, that the children of the religious may be ſaved without being baptized; that prieſts may adminiſter confirmation; that there ought to be only two orders in the church, that of prieſts, and that of deacons. He made an Engliſh verſion of the Bible; and compoſed two volumes, called Aletheia, that is, Truth, from which John Huſſ learned moſt of his doctrines. In ſhort, to this reformer we owe the firſt hint of the reformation, which was effected about two hundred years after.

WICKLOW, a county of Ireland, in the province of Leinſter, bounded by the county of Dublin on the north, by the Iriſh channel on the eaſt, by Wexford on the ſouth, and by Kildare and Katerlagh on the weſt.

WICKWARE, a market-town of Gloceſterſhire, ſituated twenty miles ſouth of Gloceſter.

WIDGEON, in ornithology. See ANAS.

WIDOW, a woman who has loſt her huſband.

WIFE, a married woman, or one joined with, and under the protection of, an huſband. See HUSBAND.

WIGGAN, a borough-town of Lancaſhire, twenty-nine miles ſouth of Lancaſter. It ſends two members to parliament.

Iſle of WIGHT, part of the county of Southampton, and ſeparated from it by a narrow channel, is about twenty miles long, and twelve broad. The chief town is Newport.

WIGTOWN, a borough and port-town of Scotland, in the ſhire of Gallo-way, ſituated on a bay of the Iriſh channel, ninety miles ſouth-weſt of Edinburgh.

WILDERNESS, in gardening, a kind of grove of large trees, in a ſpacious garden, in which the walks are commonly made either to interſect each other in angles, or have the appearance of meanders and labyrinths.

WILKOMERS, a city of Poland, in the dutchy of Lithuania: E. long. 25°, N lat. 55° 30′.

WILL, or *laſt* WILL, in law, ſignifies the declaration of a man's mind and intent relating to the diſpoſition of his lands, goods, or other eſtate, or of what he would have done after his death.

In the common law, there is a diſtinction made between a will and a teſtament; as that is called a will, where lands or tenaments are given; and when the diſpoſition concerns goods and chattels alone, it is termed a teſtament. See TESTAMENT.

WILL-*with-a-wiſp*, or *Jack-with-a-lanthorn*, a meteor known among the people under theſe names, but more uſually among authors under that of ignis fatuus.

This meteor is chiefly ſeen in ſummer-nights, frequenting meadows, marſhes, and other moiſt places. It ſeems to ariſe from a vitcous exhalation, which being kindled in the air, reflects a ſort of thin flame in the dark, without any ſenſible heat.

It is often found flying along rivers, hedges, *&c.* by reaſon it there meets with a ſtream of air to direct it. The ignus fatuus, ſays Sir Iſaac Newton, is a vapour ſhining without heat; and there is the ſame difference between this vapour and flame, as between rotten wood ſhining without heat and burning coals of fire.

WILLIAMSBURG, capital of the colony of Virginia, ſituated in James-county, between James-river and York-river: W. long. 76° 30′, N. lat. 37° 20′.

WILLIAM's FORT, a fort belonging to the Engliſh Eaſt India

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India company, ſituated on the weſtern branch of the river Ganges, in the province of Bengal: E. long. 87°, N lat. 22° 45′.

WILLIAMSTAT, a port-town of Holland, ſituated on the ſea called Hollands-Deep, fourteen miles ſouth of Rotterdam.

WILLOW, in botany. See SALIX.

WILNA, a city of Poland, capital of the great duchy of Lithuania, ſituated on a river of the ſame name: E. long. 25° 15′, N. lat. 55°.

WILTON, a borough-town of Wiltſhire, ſituated on the river Willey, ſix miles north-weſt of Saliſbury. It ſends two members to parliament.

WILTSHIRE, a county of England, bounded by Gloceſterſhire and Oxfordſhire on the north, by Berkſhire and Hampſhire on the eaſt, by Dorſetſhire on the ſouth, and by Somerſetſhire on the weſt.

WINCHELSEA, a borough and port-town of Suſſex, ſituated on a bay of the Engliſh channel, thirty miles eaſt of Lewes. It ſends two members to parliament

WINCHESTER, the capital city of Hampſhire, ſituated on the river Itching, ſixty-five miles ſouth-weſt of London.

WIND. See PNEUMATICS, p. 495.

WIND MILL, a kind of mill, the internal parts of which are much the ſame with thoſe of a water-mill, from which however it differs, in being moved by the impulſe of the wind upon its vanes, or ſails, which are to be conſidered as a wheel on the axle. See MECHANICS.

WIND-FLOWER, in botany. See ANEMONE.

WIND GALL, a name given by our farriers to a diſtemperature of horſes. See FARRIERY, p. 575.

WIND SAILS, in a ſhip, are made of the common ſail-cloth, and are uſually between twenty-five and thirty feet long, according to the ſize of the ſhip, and are of the form of a cone ending obtuſely: when they are made uſe of, they are hoiſted by ropes to about two thirds or more of their height, with their baſis diſtended circularly by hoops, and their apex hanging downwards in the hatch-ways of the ſhip; above each of theſe, one of the common ſails is ſo diſpoſed, that the greateſt part of the air ruſhing againſt it, is directed into the wind-ſail, and conveyed, as through a funnel, into the upper parts of the body of the ſhip.

WIND TACKLE BLOCKS, in a ſhip, are the main double blocks which being made faſt to the end of a ſmall cable, ſerve for hoiſting of goods into the ſhip, &c.

To WIND, or WEND *a ſhip*, ſignifies to bring her head about. *How winds or wends the ſhip?* is a queſtion aſked by mariners, concerning a ſhip under ſail; ſignifying as much as, upon what point of the compaſs does ſhe lie with her head?

WINDWARD, in the ſea-language, denotes any thing towards that point from whence the wind blows, in reſpect of a ſhip: thus windward-tide, is the tide which runs againſt the wind.

WINDAGE *of a gun*, the difference between the diameter of the bore, and the diameter of the ball.

WINDLASS, a machine uſed to raiſe huge weights withal, as guns, ſtones, anchors, &c.

It is very ſimple, conſiſting only of an axis, or roller, ſupported horizontally at the two ends, by two pieces of wood and a pully: the two pieces of wood meet at top, being placed diagonally ſo as to prop each other; the axis, or roller, goes through the two pieces, and turns in them. The pully is faſtened at top where the pieces join. Laſtly, there are two ſtaves or handſpikes which go through the roller, whereby it is turned, and the rope which comes over the pulley is wound off and on the ſame.

WINDLASS, in a ſhip, is an inſtrument in ſmall ſhips, placed upon the deck, juſt abaft the fore maſt. It is made of a piece of timber ſix or eight feet ſquare, in form of an axle-tree, whoſe length is placed horizontally upon two pieces of wood at the ends thereof, and upon which it is turned about by the help of handſpikes put into holes made for that purpoſe. This inſtrument ſerves for weighing anchors, or hoiſting of any weight in or out of the ſhip, and will purchaſe much more than any capſtan, and that without any danger to thoſe that heave; for if in heaving the windlaſs about, any of the handſpikes ſhould happen to break, the windlaſs would pall of itſelf.

WINDOW, an aperture or open place in the wall of a houſe, to let in the wind and light. See ARCHITECTURE, p. 357.

WINDSOR, a borough-town of Berkſhire, twenty miles weſt of London, moſt remarkable for the magnificent palace or caſtle ſituated there on an eminence, which commands the adjacent country for many miles, the river Thames running at the foot of the hill. The knights of the garter are inſtalled in the royal chapel here. It ſends two members to parliament.

WINE, a briſk, agreeable, ſpirituous and cordial liquor, drawn from vegetable bodies, and fermented.

All ſorts of vegetables, fruits, ſeeds, roots, &c. afford wine; as grapes, currants, mulberries, elder-berries, cherries, apples, pulſe, beans, peaſe, turneps, radiſhes, and even graſs itſelf. Hence under the claſs of wines, or vinous liquors, come not only wines abſolutely ſo called, but alſo ale, cyder, &c. See BREWING, and CHEMISTRY, p 95, 161.

Wine in France is diſtinguiſhed, from the ſeveral degrees and ſteps of its preparation, into, 1. *Mere goutte*, mother-drop, which is the virgin wine, or that which runs of itſelf out at the top of the vat wherein the grapes are laid, before the vintager enters to tread or ſtamp the grapes 2. Muſt, ſurmuſt, or ſtum, which is the wine or liquor in the vat, after the grapes have been trod or ſtamped. 3 Preſſed wine, being that ſqueezed with a preſs out of the grapes half bruiſed by the treading. The huſks left of the grapes are called rope, murk, or mark; by throwing water upon which, and preſſing them afreſh, they make a liquor for ſervants uſe, anſwerable to our cyderkin, and called *boiſſon*: 4. Sweet wine, is that which has not yet worked nor fermented. 5. Bourn, that which has been prevented working by caſting in cold water. 6. Worked wine, that which has been let work in the vat, to give it a colour. 7. Boiled wine, that which has had a boiling before it worked, and which by that means ſtill retains its native ſweetneſs. 8. Strained wine, that made by ſteeping dry grapes in water, and letting it ferment of itſelf. Wines are alſo diſtinguiſhed with regard to their colour into white wine, red wine, claret wine, pale wine, roſe, or black wine; and with regard to their country, or the ſoil that produces them, into French wines, Spaniſh wines, Rhenniſh wines, Hungary wines, Greek wines, Canary wines, &c. and more parucularly

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particularly into Port wine, Madeira wine, Burgundy wine, Champain wine, Falernian wine, Tockay wine, Schiras wine, &c.

Spirit of WINE. See CHEMISTRY, p. 163.

WING, that part of a bird, inſect, &c. whereby it is enabled to fly. See NATURAL HISTORY.

WINGS, in heraldry, are borne ſometimes ſingle, ſometimes in pairs; in which caſe, they are called conjoined. When the points are downward, they are ſaid to be inverted; when up, elevated.

WINGS, in military affairs, are the two flanks or extremes of an army, ranged in form of a battle; being the right and left ſides thereof.

WINGS, in fortification, denote the longer ſides of horn-works, crown-works, tenailles, and the like out-works; including the ramparts and parapets; with which they are bounded on the right and left, from their gorge to their front.

WINSLOW, a market-town of Bucks, ſix miles north of Aileſbury.

WINSTER, a market-town of Darbyſhire, ſituated ten miles north of Darby.

WINTER, one of the four ſeaſons or quarters of the year. See ASTRONOMY, p. 546.

WINTER's BARK, in botany, a name given to the bark of the white or wild cinnamon tree. See CINNAMON.

WINTERTONNESSE, the north cape of the county of Norfolk, four miles north of Yarmouth.

WIRE, a piece of metal drawn through the hole of an iron into a thread of a fineneſs anſwerable to the hole it paſſed through.

Wires are frequently drawn ſo fine, as to be wrought along with other threads of ſilk, wool, flax, &c.

The metals moſt commonly drawn into wire, are gold, ſilver, copper, and iron. Gold-wire is made of cylindrical ingots of ſilver, covered over with a ſkin of gold, and thus drawn ſucceſſively through a vaſt number of holes, each ſmaller and ſmaller, till at laſt it is brought to a fineneſs exceeding that of a hair. That admirable ductility which makes one of the diſtinguiſhing characters of gold, is no where more conſpicuous than in this gilt wire. A cylinder of forty eight ounces of ſilver, covered with a coat of gold, only weighing one ounce, as Dr. Halley informs us, is uſually drawn into a wire, two yards of which weigh no more than one grain; whence ninety-eight yards of the wire weigh no more than forty-nine grains, and one ſingle grain of gold covers the ninety-eight yards; ſo that the ten thouſandth part of a grain is above one-eighth of an inch long.

WIRE *of Lapland*. The inhabitants of Lapland have a ſort of ſhining ſlender ſubſtance in uſe among them on ſeveral occaſions which is much of the thickneſs and appearance of our ſilver-wire, and is therefore called, by thoſe who do not examine its ſtructure or ſubſtance, Lapland-wire. It is made of the ſinews of the rein-deer, which being carefully ſeparated in the eating, are, by the women, after ſoaking in water, and beating, ſpun into a ſort of thread, of admirable fineneſs, and ſtrength, when wrought to the ſmalleſt filaments; but when larger, is very ſtrong, and fit for the purpoſes of ſtrength and force. Their wire, as it is called, is made of the lineſt of theſe threads, covered with tin. The women do this buſineſs, and the way they take is to melt a piece of tin, and placing at the edge of it a horn with a hole through it, they draw theſe ſinewy threads, covered with the tin, through the hole, which prevents their coming out too thick covered. This drawing is performed with their teeth; and there is a ſmall piece of bone placed at the top of the hole, where the wire is made flat, ſo that we always find it rounded on all ſides but one, where it is flat.

This wire they uſe in embroidering their cloaths as we do gold and ſilver; they often ſell it to ſtrangers, under the notion of its having certain magical virtues.

WIRKSWORTH, a market-town of Darbyſhire, ſituated ſix miles north of Darby.

WISBEACH, a market-town of the iſle of Ely, in Cambridgeſhire, ſituated fifteen miles north of Ely.

WISDOM, uſually denotes a higher and more refined notion of things immediately preſented to the mind, as it were, by intuition, without the aſſiſtance of ratiocination.

WISTON, a market-town of Pembrokeſhire, ſituated ten miles north of Pembroke.

WIT is a quality of certain thoughts and expreſſions: the term is never applied to an action nor to a paſſion, and as little to an external object.

However difficult it may be, in every particular inſtance, to diſtinguiſh a witty thought or expreſſion from one that is not ſo; yet in general it may be laid down, that the term *wit* is appropriated to ſuch thoughts and expreſſions as are ludicrous, and alſo occaſion ſome degree of ſurpriſe by their ſingularity. Wit alſo, in a figurative ſenſe, expreſſes that talent which ſome men have of inventing ludicrous thoughts or expreſſions: we ſay commonly, *a witty man*, or *a man of wit*.

Wit in its proper ſenſe, as explained above, is diſtinguiſhable into two kinds; wit in the thought, and wit in the words or expreſſion. Again, wit in the thought is of two kinds; ludicrous images, and ludicrous combinations of things that have little or no natural relation.

Ludicrous images that occaſion ſurpriſe by their ſingularity, as having little or no foundation in nature, are fabricated by the imagination: and the imagination is well qualified for the office; being of all our faculties the moſt active, and the leaſt under reſtraint. Take the following example.

> *Shylock*. You knew (none ſo well, none ſo well as you) of my daughter's flight.
>
> *Salino*. That's certain: I, for my part, knew the tailor that made the wings ſhe flew withal.
>
> *Merchant of Venice, act* 3. *ſc.* 1.

The image here is undoubtedly witty. It is ludicrous: and it muſt occaſion ſurpriſe; for having no natural foundation, it is altogether unexpected.

The other branch of wit in the thought, is that only which is taken notice of by Addiſon, following Locke, who defines it "to lie in the aſſemblage of ideas; and putting thoſe together, with quickneſs and variety, wherein can be found any reſemblance or congruity, thereby to make up pleaſant pictures and agreeable viſions in the fancy." It may be defined more curtly, and perhaps more accurately, "a junction of things by diſtant and fanciful relations, which ſurpriſe becauſe they are unexpected." The following is a proper example.

> We grant although he had much wit,
> H' was very ſhy of uſing it,

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As being loth to wear it out;
And therefore bore it not about,
Unleſs on holidays, or ſo,
As men their beſt apparel do.

Hudibras, canto 1.

Wit is of all the moſt elegant recreation: the image enters the mind with gaiety, and gives a ſudden flaſh which is extremely pleaſant. Wit thereby gently elevates without ſtraining, raiſes mirth without diſſoluteneſs, and relaxes while it entertains.

Wit in the expreſſion, commonly called *a play of words*, being a baſtard ſort of wit, is reſerved for the laſt place. We proceed to examples of wit in the thought; and firſt of ludicrous images.

Falſtaff, ſpeaking of his taking Sir John Colevile of the Dale:

Here he is, and here I yield him; and I beſeech your Grace, let it be book'd with the reſt of this day's deeds; or, by the Lord, I will have it in a particular ballad elſe, with mine own picture on the top of it, Colevile kiſſing my foot: to the which courſe if I be enforced, if you do not all ſhew like gilt twopences to me; and I, in the clear ſky of fame, o'erſhine you as much as the full moon doth the cinders of the element, which ſhew like pins' heads to her; believe not the word of the noble. Therefore let me have right, and let deſert mount.

Second Part, Henry IV. *act* 4. *ſc.* 6.

I knew, when ſeven juſtices could not take up a quarrel, but when the parties were met themſelves, one of them them thought but of an *if*; as, if you had ſaid ſo, then I ſaid ſo; and they ſhook hands, and ſwore brothers. Your *if* is the only peace-maker; much virtue is in *if*.

Shakeſpear.

For there is not through all nature another ſo callous and inſenſible a member as the world's poſteriors, whether you apply to it the toe or the birch.

Preface to a Tale of a Tub.

The other branch of wit is the thought, *viz.* ludicrous combinations and oppoſitions, may be traced through various ramifications. And, firſt, fanciful cauſes aſſigned that have no natural relation to the effects produced:

Lancaſter. Fare you well, Falſtaff; I, in my condition, Shall better ſpeak of you than you deſerve. [*Exit.*

Falſtaff. I would you had but the wit; 'twere better than your dukedom. Good faith, this ſame young ſober-blooded boy doth not love me; nor a man cannot make him laugh; but that's no marvel, he drinks no wine. There's never any of theſe demure boys come to any proof; for thin drink doth ſo overcool their blood, and making many fiſh-meals, that they fall into a kind of male green ſickneſs; and then, when they marry, they get wenches. They are generally fools and cowards; which ſome of us ſhould be too, but for inflammation. A good ſherris-ſack hath a twofold operation in it: it aſcends me into the brain; dries me there all the fooliſh, dull, and crudy vapours which environ it; make it apprehenſive, quick, forgetive, full of nimble, fiery, and delectable ſhapes; which delivered o'er to the voice, the tongue, which is the birth, becomes excellent wit. The ſecond property of your excellent ſherris is, the warming of the blood; which before cold and ſettled, left the liver white and pale; which is the badge of puſillanimity and cowardice: but the ſherris warms it, and makes it courſe from the inwards to the parts extreme; it illuminateth the face, which, as a beacon, gives warning to all the reſt of this little kingdom, man, to arm; and then the vital commoners and inland petty ſpirits muſter me all to their captain, the heart; who, great, and puff'd up with this retinue, doth any deed of courage: and thus valour comes of ſherris. So that ſkill in the weapon is nothing without ſack, for that ſets it a-work; and learning a mere hoard of gold kept by a devil, till ſack commences it, and ſets it in act and uſe. Hereof comes it that Prince Harry is valiant; for the cold blood he did naturally inherit of his father, he hath, like lean, ſteril, and bare land, manured, huſbanded, and till'd with excellent endeavour of drinking good and good ſtore of fertile ſherris, that he is become very hot and valiant. If I had a thouſand ſons, the firſt human principle I would teach them, ſhould be to forſwear thin potations, and to addict themſelves to ſack.

Second Part of Henry IV. *act* 4. *ſc.* 7.

The trenchant blade, toledo truſty,
For want of fighting was grown ruſty,
And ate into itſelf, for lack
Of ſome body to hew and hack.
The peaceful ſcabbard where it dwelt
The rancor of its edge had felt:
For of the lower end two handful
It had devoured, t'was ſo manful;
And ſo much ſcorn'd to lurk in caſe,
As if it durſt not ſhew its face.

Hudibras, canto 1.

To account for effects by ſuch fantaſtical cauſes, being highly ludicrous, is quite improper in any ſerious compoſition. Therefore the following paſſage from Cowley, in his poem on the death of Sir Henry Wooton, is in a bad taſte.

He did the utmoſt bounds of knowledge find,
He found them not ſo large as was his mind.
But, like the brave Pellæan youth, did moan,
Becauſe that art had no more worlds than one.
And when he ſaw that he through all had paſt,
He dy'd, leſt he ſhould idle grow at laſt.

Fanciful reaſoning:

Falſtaff. Imbowell'd!——if thou imbowel me to day, I'll give you leave to powder me, and eat me to-morrow! S'blood, 'twas time to counterfeit, or that hot termagant Scot had paid me ſcot and lot too. Counterfeit? I lie. I am no counterfeit: to die is to be a counterfeit; for he is but the counterfeit of a man, who hath not the life of a man; but to counterfeit dying, when a man thereby liveth, is to be no counterfeit, but the true and perfect image of life indeed.

Firſt Part Henry IV. *act* 1. *ſc.* 10.

Clown. And the more pity that great folk ſhould have countenance in this world to drown or hang themſelves, more than their even Chriſtians.

Hamlet, act 5. *ſc.* 2.

Pedro. Will you have me, Lady?

Beatrice. No, my Lord, unleſs I might have another for working days. Your Grace is too coſtly to wear every day.

Much ado about nothing, Act 2. *ſc.* 5.

Jeſſica.

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Jeſſica. I ſhall be ſaved by my huſband; he hath made me a Chriſtian.

Launcelot. Truly the more to blame he; we were Chriſtians enough before, e'en as many as could well live by one another: this making of Chriſtians will raiſe the price of hogs; if we grow all to be pork-eaters, we ſhall not have a raſher on the coals for money.

Merchant of Venice, Act 3. *ſc.* 6.

But Hudibras gave him a twitch,
As quick as lightning, in the breech,
Juſt in the place where honour's lodg'd,
As wiſe philoſophers have judg'd;
Becauſe a kick in that part, more
Hurts honour, than deep wounds before.

Hudibras, canto 3.

Ludicrous junction of ſmall things with great, as of equal importance:

This day black omens threat the brighteſt fair
That e'er deſerv'd a watchful ſpirit's care:
Some dire diſaſter, or by force, or ſlight:
But what, or where, the fates have wrapt in night:
Whether the nymph ſhall break Diana's law;
Or ſome frail china jar receive a flaw:
Or ſtain her honour, or her new brocade;
Forget her pray'rs, or miſs a maſquerade;
Or loſe her heart, or necklace, at a ball;
Or whether Heav'n has doom'd that Shock muſt fall.

Rape of the Lock, canto ii. 101.

One ſpeaks the glory of the Britiſh Queen,
And one deſcribes a charming Indian ſcreen.

Ibid. canto iii. 13.

Then flaſh'd the living lightning from her eyes,
And ſcreams of horror rend th'affrighted ſkies.
Not louder ſhrieks to pitying heav'n are caſt,
When huſbands, or when lapdogs, breathe their laſt;
Or when rich china veſſels, fall'n from high,
In glittering duſt and painted fragments lie!

Ibid. canto iii. 155.

Not youthful kings in battle ſeiz'd alive,
Not ſcornful virgins who their charms ſurvive,
Not ardent lovers robb'd of all their bliſs,
Not ancient ladies when refus'd a kiſs,
Nor tyrants fierce that unrepenting die,
Nor Cynthia when her manteau's pinn'd awry,
E'er felt ſuch rage, reſentment, and deſpair,
As thou, ſad virgin! for thy raviſh'd hair.

Ibid. canto iv. 3.

Joining things that in appearance are oppoſite. As for example, where Sir Roger de Coverley, in the ſpectator, ſpeaking of his widow,

That he would have given her a coal-pit to have kept her in clean linen; and that her finger ſhould have ſparkled with one hundred of his richeſt acres.

Premiſſes that promiſe much and perform nothing. Cicero upon this article ſays,

Sed ſcitis eſſe notiſſimum ridiculi genus, cum aliud expectamus, aliud dicitur: hic nobiſmetipſis noſter error riſum movet. *De oratore, l.* 2. *c.* 63.

Beatrice.——With a good leg and a good foot, uncle, and money enough in his purſe, ſuch a man would win any woman in the world, if he could get her good will.

Much ado about nothing, Act. 2. *ſc.* 1.

Beatrice. I have a good eye, uncle, I can ſee a church by day-light.

Having diſcuſſed wit in the thought, we proceed to what is verbal only, commonly called *a play of words.* This ſort of wit depends, for the moſt part, upon chuſing a word that hath different ſignifications: by this artifice, hocus-pocus tricks are played in language; and thoughts plain and ſimple take on a very different appearance. Play is neceſſary for man, in order to refreſh him after labour; and accordingly man loves play: he even reliſhes a play of words: and it is happy for us, that words can be employed, not only for uſeful purpoſes, but alſo for our amuſement. This amuſement accordingly, though humble and low, is reliſhed by ſome at all times, and by all at ſome times, in order to unbend the mind.

It is remarkable, that this low ſpecies of wit, has, at one time or other, made a figure in moſt civilized nations, and has gradually gone into diſrepute. So ſoon as a language is formed into a ſyſtem, and the meaning of words is aſcertained with tolerable accuracy, opportunity is afforded for expreſſions, which, by the double meaning of ſome words, give a familiar thought the appearance of being new; and the penetration of the reader or hearer is gratified, in detecting the true ſenſe diſguiſed under the double meaning. That this ſort of wit was in England deemed a reputable amuſement, during the reigns of Eliſabeth and James I. is vouched by the works of Shakeſpear, and even by the writings of grave divines. But it cannot have any long endurance: for as language ripens, and the meaning of words is more and more aſcertained, words held to be ſynonymous diminiſh daily; and when thoſe that remain have been more than once employed, the pleaſure vaniſheth with the novelty.

We proceed to examples, which, as in the former caſe, ſhall be diſtributed into different claſſes.

A ſeeming reſemblance from the double meaning of a word:

Beneath this ſtone my wife doth lie;
She's now at reſt, and ſo am I.

A ſeeming contraſt from the ſame cauſe, termed *a verbal antitheſis*, which hath no deſpicable effect in ludicrous ſubjects:

Whilſt Iris his coſmetic waſh would try
To make her bloom revive, and lovers die.
Some aſk for charms, and others philters chuſe,
To gain Corinna, and their quartans loſe.

Diſpenſary, canto 2.

And how frail nymphs, oft, by abortion, aim
To loſe a ſubſtance, to preſerve a name.

Ibid. canto 3.

While nymphs take treats, or aſſignations give.

Rape of the Lock.

Other ſeeming connections from the ſame cauſe:

Will you employ your conqu'ring ſword,
To break a fiddle and your word?

Hudibras, canto 2.

To whom the knight with comely grace
Put off his hat to put his caſe.

Hudibras, part 3. *canto* 3.

Here:

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Here Britain's ſtateſmen oft the fall foredoom
Of foreign tyrants, and of nymphs at home;
Here thou, great Anna! whom three realms obey,
Doſt ſometimes counſel take—and ſometimes tea.

Rape of the Lock, canto 3. *l.* 5.

O'er their quietus where fat judges doſe,
And lull their cough and conſcience to repoſe.

Diſpenſary, canto 1.

Speaking of Prince Eugene:

This general is a great taker of ſnuff as well as of towns.

Pope, Key to the Lock,

Exul mentiſque domuſque.

Metamorphoſes, lib. ix. 409.

A ſeeming oppoſition from the ſame cauſe:

Hic quieſcit qui nunquam quievit.

Again,

So like the chances are of love and war,
That they alone in this diſtinguiſh'd are;
In love the victors from the vanquiſh'd fly,
They fly that wound, and they purſue that die.

Waller.

What new-found witchcraft was in thee,
With thine own cold to kindle me?
Strange art; like him that ſhould deviſe
To make a burning glaſs of ice.

Cowley.

Wit of this kind is unſuitable in a ſerious poem; witneſs the following line in Pope's Elegy to the memory of an unfortunate lady:

Cold is that breaſt which warm'd the world before.

This ſort of writing is finely burleſqued by Swift:

Her hands, the ſofteſt ever felt,
Though cold would burn, though dry would melt.

Strephon and Chloe.

Taking a word in a different ſenſe from what is meant, comes under wit, becauſe it occaſions ſome ſlight degree of ſurpriſe:

Beatrice. I may ſit in a corner, and cry *Heigh ho!* for a huſband.

Pedro. Lady Beatrice, I will get you one.

Beatrice. I would rather have one of your father's getting. Hath your Grace ne'er a brother like you? Your father got excellent huſbands, if a maid could come by them.

Much ado about nothing, act 2. *ſc.* 5.

Falſtaff. My honeſt lads, I will tell you what I am about.

Piſtol. Two yards and more.

Falſtaff. No quips now, Piſtol: indeed, I am in the waſte two yards about: but I am now about no waſte; I am about thrift.

Merry Wives of Windſor, act 1. *ſc.* 7.

Lo. Sands.——By your leave, ſweet ladies,
If I chance to talk a little wild, forgive me:
I had it from my father.

Anne bullen. Was he mad, Sir?

Sands. O, very mad, exceeding mad, in love too;
But he would bite none——

K. Henry VIII.

An aſſertion that bears a double meaning, one right, one wrong, but ſo connected with other matters as to direct us to the wrong meaning, is a ſpecies of baſtard wit which is diſtinguiſhed from all others by the name *pun*. For example,

Paris.——Sweet Helen, I muſt woo you
To help unarm our Hector: his ſtubborn buckles,
With theſe your white inchanting fingers touch'd,
Shall more obey, than to the edge of ſteel,
Or force of Greekiſh ſinews; you ſhall do more
Than all the iſland kings, diſarm great Hector.

Troilus and Creſſida, act 3. *ſc.* 2.

The pun is in the cloſe. The word *diſarm* has a double meaning: it ſignifies to take off a man's armour, and alſo to ſubdue him in fight. We are directed to the latter ſenſe by the context; but with regard to Helen, the word holds only true in the former ſenſe. We go on with other examples:

Eſſe nihil dicis quicquid petis, improbe Cinna:
Si nil, Cinna; petis, nil tibi, Cinna, nego.

Martial, l. 3. *epigr.* 61.

Chief Juſtice. Well! the truth is, Sir John, you live in great infamy.

Falſtaff. He that buckles him in my belt cannot live in leſs.

Chief Juſtice. Your means are very ſlender, and your waſte is great.

Falſtaff. I would it were otherwiſe: I would my means were greater, and my waſte ſlenderer.

Second part Henry IV. *act* 1. *ſc.* 5.

Celia. I pray you bear with me, I can go no further.

Clown. For my part, I had rather bear with you than bear you: yet I ſhould bear no croſs if I did bear you; for I think you have no money in your purſe.

As you like it, act 2. *ſc.* 4.

He that impoſes an oath makes it,
Not he that for convenience takes it.
Then how can any man be ſaid
To break an oath he never made?

Hudibras, part 2. *canto* 2.

The ſeventh ſatire of the firſt book of Horace is purpoſely contrived to introduce at the cloſe a moſt execrable pun. Talking of ſome infamous wretch whoſe name was *Rex Rupilius*,

Perſius exclamat, Per magnos, Brute, deos te
Oro, qui reges conſueris tollere, cur non
Hunc regem jugulas? Operum hoc, mihi crede, tuorum eſt.

Though playing with words is a mark of a mind at eaſe, and diſpoſed to any ſort of amuſement, we muſt not thence conclude that playing with words is always ludicrous. Words are ſo intimately connected with thought, that if the ſubject be really grave, it will not appear ludicrous even in this fantaſtic dreſs. We are, however, far from recommending it in any ſerious performance: on the contrary, the diſcordance between the thought and expreſſion muſt be diſagreeable; witneſs the following ſpecimen.

He

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He hath abandoned his phyſicians. Madam, under whoſe practices he hath perſecuted time with hope; and finds no other advantage in the proceſs, but only the loſing of hope by time.

All's well that ends well, act 1. *ſc* 1.

K. Henry. O my poor kingdom, ſick with civil blows!
When that my care could not with-hold thy riots,
What wilt thou do when riot is thy care?

Second part K. Henry IV.

If any one ſhall obſerve, that there is a third ſpecies of wit, different from thoſe mentioned, conſiſting in ſounds merely, we are willing to give it place. And indeed it muſt be admitted, that many of Hudibras's double rhymes come under the definition of wit given in the beginning of this article: they are ludicrous, and their ſingularity occaſions ſome degree of ſurpriſe. Swift is not leſs ſucceſsful than Butler in this ſort of wit; witneſs the following inſtances: *Goddeſs—Boddice. Pliny—Nicolini. Iſcariots—Chariots. Mitre—Nitre. Dragon—Suffragan.*

A repartee may happen to be witty: but it cannot be conſidered as a ſpecies of wit; becauſe there are many repartees extremely ſmart, and withal extremely ſerious. We give the following example. A certain petulant Greek, objecting to Anacharſis that he was a Scythian: True, ſays Anacharſis, my country diſgraces me, but you diſgrace your country. This fine turn gives ſurpriſe; but it is far from being ludicrous.

WITCHCRAFT, a kind of ſorcery, eſpecially in women, in which it is ridiculouſly ſuppoſed that an old woman, by entering into a contract with the devil, is enabled, in many inſtances, to change the courſe of nature; to raiſe winds; perform actions that require more than human ſtrength; and to afflict thoſe who offend them with the ſharpeſt pains, *&c.* In the times of ignorance and ſuperſtition, many ſevere laws were made againſt witches, by which great numbers of innocent perſons, diſtreſſed with poverty and age, were brought to a violent death; but theſe are now happily repealed. See LAW, Tit. xxxiii. 8.

WITENA MOT or WITENA GEMOT, among our Saxon anceſtors, was a term which literally ſignified the aſſembly of the wiſe men, and was applied to the great council of the nation, of latter days called the parliament.

WITEPSKI, the capital of the palatinate of the ſame name, in the duchy of Lithuania, in Poland: E. long 30°, N. lat 56°

WITHAM, a market-town of Eſſex, ten miles north-eaſt of Chelmsford.

WITHERS of a horſe, the juncture of the ſhoulder-bones at the bottom of the neck and main, towards the upper part of the ſhoulder.

WITNESS, in law, a perſon who gives evidence in any cauſe, and is ſworn to ſpeak the truth, the whole truth, and nothing but the truth. See LAW, Tit. xxi. 4, *&c.* and Tit. xxxi 1, *&c.*

WITNEY, a market-town of Oxfordſhire, ſeven miles weſt of Oxford. Here is the greateſt manufacture of blankets in England.

WITTENBURG, a city of Germany, in the circle of Upper Saxony, fifty miles north of Dreſden.

WITTLESEYMERE, a lake in the iſle of Ely, on the confines of Huntingdonſhire, ſix miles long and three broad.

WIVELSCOMB, a market-town of Somerſetſhire, ſituated twenty-ſeven miles ſouth-weſt of Wells.

WOAD, in botany. See ISATIS.

WOBURN, a market-town of Bedfordſhire, ten miles ſouth of Bedford.

WOLAW, the capital of a duchy of the ſame name, in Bohemia: E. long. 16° 38′. N. lat. 51° 22′.

WOLF, in zoology See CANIS.

WOLFEMBUTTLE, a city of Germany, in the circle of lower Saxony, and duchy of Brunſwick: E. long. 10° 32′, N. lat. 52° 20′.

WOLFERDYKE, an iſland of the united Netherlands, in the province of Zealand, ſituated between the iſlands of north Beveland and ſouth Beveland.

WOLGA, a large river of Ruſſia, which riſing in the north of that empire, runs ſouth-eaſt till it falls into the Caſpian ſea, about fifty miles below Aſtracan, after its having run a courſe of between two and three thouſand miles.

WOLGAST, a city and port-town of Germany, in the circle of Upper Saxony, and duchy of Pomerania, ſubject to Sweden: E. long. 14° 5′, N. lat. 54° 12′.

WOLKOWSKA, a city of Poland, in the duchy of Lithuania, and palatinate of Novogrodeck: E. long. 24°, N lat 53°.

WOLLIN, a town and iſland of Pomerania, ſituated in the Baltic ſea, at the mouth of the river Oder, ſubject to the king of Pruſſia.

WOLODOMIR, the capital of a province of the ſame name in Ruſſia: E. long. 30° 5′, N. lat. 57° 40′.

WOLOGDA, the capital of a province of the ſame name in Ruſſia, ſituated on the river Dwina: E. long. 42° 20′, N. lat. 59°.

WOLVERHAMPTON, a market-town of Staffordſhire, eleven miles ſouth of Stafford.

WOLVES-TEETH, of an horſe, are over-grown grinders, the points of which being higher than the reſt, prick his tongue and gums in feeding, ſo as to hinder his chewing. They are ſeldom met with in any beſides young horſes; but if they be not daily worn by chewing, they will grow up even to pierce the roof of the mouth.

WOMAN, the female of man. See HOMO.

WOMB. See ANATOMY, p. 274.

WOOD, a ſolid ſubſtance, whereof the trunks and branches of trees conſiſt.

The wood is all that part of a tree included between the bark and the pith. For the ſtructure of the pith, bark, wood, *&c.* of plants, ſee AGRICULTURE, p. 40.

WOODBRIDGE, a market-town of Suffolk, ſituated twenty-ſix miles ſouth-eaſt of Bury.

WOOD COCK, in ornithology. See SCOLOPAX.

WOOD LOUSE, in zoology. See ONISCUS.

WOOD PECKER, in ornithology. See PICUS.

WOODSTOCK, a borough-town of Oxfordſhire, ſituated ſeven miles north of Oxford. It ſends two members to parliament.

WOOF, among manufacturers, the threads which the weaver ſhoots acroſs with an inſtrument called the ſhuttle, See CLOTH

WOOL, the covering of ſheep. See OVIS

WOOLWICH, a market-town of Kent, ſituated on the river Thames, ſix miles eaſt of London.

WORCESTER, the capital city of worceſterſhire, ſituated

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ted on the river Severn, 110 miles north-weſt of London: W long. 2° 15′, N. lat. 52° 5′.

WORCUM, a town of Holland, ſituated on the river Waal, twenty-three miles eaſt of Rotterdam. This is alſo the name of a port-town of the United Netherlands, ſituated on the province of Friezland, on the Zuyder-ſea, twenty miles ſouth-weſt of Lewarden.

WORD, in language, an articulate ſound deſigned to repreſent ſome idea See GRAMMAR and LANGUAGE.

WORKSOP, a market-town of Nottinghamſhire, ſituated twenty miles north of Nottingham.

WORLD, the aſſemblage of parts which compoſe the globe of the earth. See GEOGRAPHY and ASTRONOMY.

WORMS. See NATURAL HISTORY.

WORMS, in medicine. See MEDICINE, p. 160.

Earth-WORM. See LUMBRICUS.

WORM, in gunnery, a ſcrew of iron, to be fixed on the end of a rammer, to pull out the wad of a firelock, carabine, or piſtol, being the ſame with the wad-hook, only the one is more proper for ſmall arms, and the other for cannon.

WORM, in chemiſtry is a long, winding, pewter pipe, placed in a tub of water, to cool and condenſe the vapours in the diſtillation of ſpirits.

WORMS, in geography, an imperial city of Germany, in the palatinate of the Rhine: E. long. 8° 5′, N. lat 49° 38′.

WORMWOOD, in botany. See ARTEMISIA.

WORSTED, a kind of woolen thread, which, in the ſpinning, is twiſted harder than ordinary. It is chiefly uſed either wove or knit into ſtockings, caps, gloves, or the like.

WORSTED, a market-town of Norfolk, ſituated ſeven miles north of Norwich.

WOTTON, a market-town of Glouceſterſhire, ſituated ſeventeen miles ſouth of Glouceſter.

WOTTON BASSET, a borough-town of Wiltſhire, twenty five miles north of Saliſbury; which ſends two members to parliament.

WOUND, in ſurgery. See SURGERY, p. 643.

WRASSE, or OLD-WIFE, in ichthyology. See LABRUS.

WREATH, in heraldry, a roll of fine linen or ſilk (like that of a Turkiſh turbant) conſiſting of the colours borne in the eſcutcheon, placed in an atchievement between the helmet and the creſt, and immediately ſupporting the creſt.

WREN, in ornithology. See MOTACILLA.

WRESTLING, a kind of combat or engagement between two perſons unarmed, body to body, to prove their ſtrength and dexterity and try which can throw his opponent to the ground. See GAMES, *&c*

WREXHAM, a market-town of Denbighſhire, in Wales, ſituated twenty-three miles ſouth eaſt of St Aſaph.

WRINTON, a market-town of Somerſetſhire, ſituated ſeven miles north of Wells.

WRIST, in anatomy. See ANATOMY, p. 179.

WRIT in law, ſignifies, in general, the king's precept in writing under ſeal, iſſuing out of ſome court, directed to the ſheriff, or other officer, and commanding ſomething to be done in relation to a ſuit or action, or giving commiſſion to have the ſame done.

WRITING, the art or act of ſignifying and conveying our ideas to others, by letters, or characters, viſible to the eye See COMPOSITION, GRAMMAR, and LANGUAGE.

WRONG, in a logical ſenſe. See ERROR, FALSEHOOD, TRUTH, *&c*.

WRONG, in a legal ſenſe, the ſame with injury, or tort.

WRONGOUS *Impriſonment*, in Scots law. See LAW, Tit. XXXIII. 23.

WURTEMBURG in Germany, is the north part of the circle of Swabia

WURTZBURG, a city of Germany, in the circle of Franconia, capital of the biſhopric of that name, ſituated on the river Maine: in E. long. 9° 50′, N. lat. 49° 46′.

WYE, a market-town of Kent, ſituated twenty miles ſouth-eaſt of Maidſtone.

WYE is alſo a river of Wales, which, riſing on the confines of Cardiganſhire, and running ſouth-eaſt, divides the counties of Radnor and Brecknock, then croſſing Herefordſhire it turns ſouth, and falls into the mouth of the Severn at Chepſtow.

X.

XAN

XACA, a port-town of Sicily in the province of Mazara, forty miles ſouth of Palermo: E. long. 13°, N. lat. 37°.

XALISCO, a city of Mexico, in America, ſituated near the Pacific ocean, four hundred miles weſt of the capital city of Mexico: W. long. 110°, and N lat. 22° 20′.

XANSI, a province of China, bounded by the province of Peking on the eaſt, by the great wall on the north, by the province of Honan on the ſouth, and by the river Croceï, which divides it from the province of Xenſi, on the weſt.

XANTHIUM, in botany, a genus of the monœcia pentandria claſs. The common calix of the male is imbricated; the corolla is funnel ſhaped, and divided into five ſegments; and the receptacle is paleaceous: The calix of the female conſiſts of two leaves, including two flowers; it has no corolla; the drupa is dry, muricated, and divided into two ſegments; and the nucleus has two cells. There are three ſpecies, only one of them, viz. the ſtrumarium, or leſſer burdock, a native of Britain.

XANTUM, a province of China, in Aſia, bounded by the Kang ſea on the north, by the gulf of Nankin on the eaſt, by the province of Nankin on the ſouth, and by the province of Pekin on the weſt.

St. XAVIER, a town of the province of La Plata, or Guayra, in South America, ſituated on the confines of Bra-

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fil, two hundred miles weſt of Rio Janeiro: W. long. 50°, S. lat. 24°.

XENSI a province of China, bounded by the great wall on the north, by the province of Xanſi on the eaſt, by the province of Suchuen on the ſouth, and by Tibet on the weſt.

XERANTHEMUM, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is paleaceous; the pappus is ſetaceous; and the calix is imbricated, and radiated. There are eleven ſpecies, none of them natives of Britain.

XEROPHAGIA, in church-hiſtory, the eating of dried foods: ſo the ancient Chriſtians called certain faſt-days, on which they eat nothing but bread and ſalt, and drank only water: ſometimes they added pulſe, herbs, and fruits. This ſort of faſting was obſerved chiefly in the holy-week, out of devotion, and not by obligation.

XICHU, a city of China, in the province of Huguam: E. long. 112°, N lat. 27°.

XINYAN, a city of Aſia, in the province of Laotung: E. long. 120°, N. lat. 31°.

XIPHIAS, in ichthyology, a genus belonging to the order of apodes. The upper jaw terminates in a long ſword ſhaped roſtrum: from which it is called the ſword-fiſh: there are no teeth in the mouth; the gill-membrane has eight rays; and the body is ſomewhat cylindrical. There is but one ſpecies, found in the European ocean.

XIPHOIDES, in anatomy See ANATOMY, p. 175.

XYLO-ALOES, or ALOE-WOOD, in pharmacy. See ALOE.

This drug is diſtinguiſhed into three ſorts, the calambac, the common lignum aloes, and calambour.

The calambac, or fineſt aloes-wood, called by authors lignum aloes præſtantiſſimum, and by the Chineſe ſukhiang, is the moſt reſinous of all the woods we are acquainted with: it is of a light ſpongy texture, very porous, and its pores ſo filled up with a ſoft and fragrant reſin, that the whole may be preſſed and dented by the fingers like wax, or moulded about by chewing in the mouth, in the manner of maſtich. This kind, laid on the fire, melts in great parts like reſin, and burns away in a few moments, with a bright flame and perfumed ſmell. Its ſcent, while in the maſs, is very fragrant and agreeable; and its taſte acrid and bitteriſh, but very aromatic and agreeable: it is ſo variable in its colour, that ſome have divided it into three kinds, the one variegated with black and purple; the ſecond, with the ſame black, but with yellowiſh inſtead of purple; and the third, yellow alone, like the yolk of an egg: this laſt is the leaſt eſteemed of the three: the ſubſtance, however, in them all, is the ſame in every reſpect, except their colour It is brought from Cochinchina.

The lignum aloes vulgare is the ſecond in value This is of a more denſe and compact texture, and conſequently leſs reſinous than the other; there is ſome of it, however, that is ſpongy, and has the holes filled up with the right reſinous matter; and all of it, when good, has veins of the ſame reſin in it. We meet with it in ſmall fragments, which have been cut and ſplit from larger; theſe are of a tolerably denſe texture in the more ſolid pieces, and of a duſky brown colour, variegated with reſinous black veins. It is in this ſtate very heavy, and leſs fragrant than in thoſe pieces which ſhew a multitude of little holes, filled up with the ſame blackiſh matter that forms the veins in others. The woody part of theſe laſt pieces is ſomewhat darker than the other, and is not unfrequently purpliſh, or even blackiſh. The ſmell of the common aloe-wood is very agreeable, but not ſo ſtrongly perfumed as the former. Its taſte is ſomewhat bitter and acrid, but very aromatic. This wood is alſo brought from Cochinchina, and ſometimes from Sumatra.

The calambour, or, as ſome write it, calambouc, is alſo called agallochum ſylveſtre, and lignum aloes mexicanum. It is a light and friable wood, of a duſky and often mottled colour, between a duſky green black, and a deep brown. Its ſmell is fragrant and agreeable, but much leſs ſweet than that of either of the others; and its taſte bitteriſh, but not ſo much acrid or aromatic as either of the two former. We meet with this very frequent, and in large logs; and theſe ſometimes entire, ſometimes only the heart of the tree, the cortical part being ſeparated. This is brought from the iſland of Timor, and is the aloe-wood uſed by the cabinet-makers and inlayers.

The Indians uſe the calambac by way of incenſe, burning ſmall pieces of it in the temples of their gods; and ſometimes their great people burn it in their houſes, in times of feaſting. It is eſteemed a cordial, taken inwardly; and they ſometimes give it in diſorders of the ſtomach and bowels, and to deſtroy worms. A very fragrant oil may be procured from it, by diſtillation; which is recommended in paralytic caſes, from five to fifteen drops. It is at preſent however, but little uſed; and would ſcarce be met with any where in the ſhops, but that it is an ingredient in ſome of the old compoſitions

XYLO-BALSAMUM, a name which naturaliſts give to the wood of the tree which yields that precious gum known to the Latins by the name of opobalſamum, and to us by the balm of Gilead. See BALSAM.

We have branches of this tree brought us from Cairo: they are very ſtrait, brittle, unequal, and full of knots; their bark reddiſh without, and greeniſh within. The xylo-balſamum is reputed good to ſtrengthen the brain and ſtomach, and to expel poiſon.

XYLOCASIA, in the materia medica, the ſame with the caſſia ligna. See CASSIA.

XYLON, the BRICKLY COTTON-TREE, in botany, a genus of the polyandria monogynia claſs of plants, the corolla whereof conſiſts of a ſingle petal, divided into five oval hollow patent ſegments; the fruit is a large, oblong, turbinated capſule, formed of five woody valves, and containing five cells; the ſeeds are roundiſh, and fixed to a columnar pentagonal receptacle, and have a quantity of fine down, or cotton, adhering to them.

XYNOECIA, in Grecian antiquity, an anniverſary feaſt, obſerved by the Athenians, in honour of Minerva, upon the ſixteenth of Hecatombæon, in memory that, by the perſuaſion of Theſeus, they left their country ſeats, in which they lay diſperſed here and there in Attica, and united together in one body.

XYRIS, in botany, a genus of the triandria monogynia claſs. The corolla conſiſts of three equal crepated petals; and the gluma conſiſts of two valves. There is but one ſpecies, a native of India.

XYSTARCHA, in antiquity, the maſter or director of the xyſtus. In the Greek gymnaſium, the xyſtarcha was the ſecond

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ſecond officer, and the gymnaſiarcha the firſt; the former was his lieutenant, and preſided over the two xyſti, and all exerciſes of the athletæ therein.

XYSTUS, among the Greeks, was a long portico, open or covered at the top, where the athletæ practiſed wreſtling and running: the gladiators, who practiſed therein, were called xyſtici.

Among the Romans, the xyſtus was only an alley, or double row of trees, meeting like an arbour, and forming a ſhade to walk under.

Y.

Y A W

YACHT, or YATCH, a veſſel with one deck, carrying from four to twelve guns. See SHIP.

YARD, a meaſure of length uſed in Britain and Spain, conſiſting of three feet, chiefly to meaſure cloth, ſtuffs, *&c.*

YARD, in anatomy. See ANATOMY p. 270.

YARDS *of a ſhip*, are thoſe long pieces of timber which are made a little tapering at each end, and are fitted athwart its proper maſt, with the ſails made faſt to them. ſo as to be hoiſted up, or lowered down, as occaſion ſerves. They have their names from the maſts unto which they belong.

YARD-ARM is that half of the yard that is on either ſide of the maſt, when it lies athwart the ſhip.

YARDS alſo denote places belonging to the navy, where the ſhips of war, *&c.* are laid up in harbour. There are, belonging to his majeſty's navy, ſix great yards, *viz.* Chatham, Deptford, Woolwich, Portſmouth, Sheerneſs, and Plymouth: theſe yards are fitted with ſeveral docks, wharfs, lanches. and graving places for the building, repairing, and cleaning of his majeſty's ſhips; and therein are lodged great quantities of timber, maſts, planks, anchors, and other materials: there are alſo convenient ſtore-houſes in each yard, in which are laid up vaſt quantities of cables, rigging, ſails, blocks, and all other ſorts of ſtores needful for the royal navy.

YARE, among ſailors, implies ready or quick: as, be yare at the helm; that is, be quick, ready, and expeditious at the helm. It is ſometimes alſo uſed for bright by ſeamen: as, to keep his arms yare; that is, to keep them clean and bright.

YARE, a river of Norfolk, which runs from weſt to eaſt, through that country, paſſing by Norwich, and falling into the German ſea at Yarmouth.

YARMOUTH, a borough and port town of Norfolk, ſituated on the German ſea, at the mouth of the river Yare, twenty miles eaſt of Norwich. It ſends two members to parliament.

YARMOUTH is alſo a borough-town of the Iſle of Wight, in Hampſhire, ſituated on the north-weſt coaſt of the Iſland, ſix miles weſt of Newport. It ſends two members to parliament.

YARN, wool or flax ſpun into thread, of which they weave cloth. See CLOTH.

YARUM, a market-town of the north riding of Yorkſhire, ſituated on the river Tees, thirty miles north of York.

YAWNING, an involuntary opening of the mouth, occaſioned by a vapour or ventoſity endeavouring to eſcape, and generally witneſſing an irkſome wearineſs, or an inclination to ſleep. Yawning, according to Boerhaave, is performed by expanding at one and the ſame time all the muſcles capable of ſpontaneous motion; by greatly extending the lungs; by drawing in gradually and ſlowly a large quantity of air; and gradually and ſlowly breathing it out, after it has been retained for ſome time, and rarified; and then reſtoring the muſcles to their natural ſtate. Hence the effect of yawning is to move, accelerate, and equally diſtribute all the humours through all the veſſels of the body, and conſequently to quality the muſcles and organs of ſenſation for their various functions.

Y E O

Sanctorius obſerves, that a great deal is inſenſibly diſcharged, when nature endeavours to get rid of the retained perſpirable matter, by yawning and ſtretching of the limbs. To theſe a perſon is moſt inclined juſt after ſleep, becauſe, a greater quantity going off by the pores of the ſkin than at other times, whenſoever a perſon wakes, the increaſed contraction that then happens cloſes a great deal of the perſpirable matter in the cutaneous paſſages, which will continually give ſuch irritations as excite yawning and ſtretching; and ſuch motions, by ſhaking the membranes of the whole body, and ſhifting the contacts of their fibres, and the incloſed matter, by degrees throw it off. Hence we ſee the reaſon why healthful ſtrong people are moſt inclined to ſuch motions, becauſe they perſpire moſt in time of ſleep, and therefore have more of the perſpirable matter to lodge in the pores, and greater irritations thereunto.

YAWS, in the ſea language. A ſhip is ſaid to make yaws, when ſhe does not ſteer ſteady, but goes in and out when there is a ſtiff gale.

YAWS, a diſtemper endemial to Guinea and the hotter climates in Africa. See MEDICINE, p. 137.

YEAR. See ASTRONOMY, p. 489.

YEAR *and Day* in Scots law. See LAW, Tit. vi. 21, 22.

YELLOW, one of the original colours of light.

YELLOWS, a diſeaſe in a horſe, much the ſame with that called the jaundice in man. See FARRIERY p. 561.

YELLOW HAMMER, in ornithology. See FRINGILLA.

YEOMAN, the firſt or higheſt degree among the plebeians of England, next in order to the gentry.

The Yeomen are properly freeholders, who having land of their own, live on good huſbandry.

YEOMAN is alſo a title of office in the king's houſhold, of a middle place or rank between an uſher and a groom.

YEOMAN

YEOMEN *of the guard* were anciently two hundred and fifty men of the beſt rank under gentry, and of larger ſtature than ordinary, each being required to be ſix feet high.

At preſent there are but one hundred yeomen in conſtant duty, and ſeventy more not in duty; and as any of the hundred dies, his place is ſupplied out of the ſeventy.

They go dreſſed after the manner of king Henry VIII's time. They formerly had diet as well as wages when in waiting, but this was taken off in the reign of queen Anne.

YEOVIL, a market-town of Somerſetſhire, ſituated eighteen miles ſouth of Wells.

YEST, a head or ſcum riſing upon beer or ale, while working or fermenting in the vat. See BREWING.

It is uſed for a leaven or forment in the baking of bread, as ſerving to ſwell or puff it up very conſiderably in a little time, and to make it much lighter, ſofter, and more delicate.

YEW, in botany. See TAXUS.

YLA, one of the weſtern iſlands of Scotland, ſituated in the Iriſh-ſea, weſt of Cantire.

YNCA, an appellation anciently given to the kings of Peru, and the princes of their blood; the word literally ſignifying lord, king, emperor, and royal blood.

YOAK, or YOKE, in agriculture, a frame of wood, fitted over the necks of oxen, whereby they are coupled together, and harneſſed to the plough.

YOAK *of land* in our ancient cuſtoms, was the ſpace which a yoke of oxen, that is, two oxen, may plow in one day.

Sea YOAK. When the ſea is ſo rough that the helm cannot be governed by the hands, the ſeamen make a yoak to ſteer by; that is, they fix two blocks to the end of the helm, and reeving two ſmall ropes through them, which they call falls, by having ſome men at each tackle, they govern the helm by direction. They have another way of making a ſea yoak, by taking a double turn about the end of the helm with a ſingle rope, the ends being laid to the ſhip's ſides, by means whereof they guide the helm.

YOANGFU, a city of China, in the province of Huguam, ſituated on the river Kiam. E. long. 114°, N. lat 30° 40'.

YOLK, the yellow part in the middle of an egg. See EGG.

YONNE, a river in France, which riſing in Burgundy, and running north through Nivernois and Champaign, falls into the Seyne at Monterau ſur Yonne.

YORK, the capital city of Yorkſhire, ſituated on the river Ouſe, 180 miles north of London: W. long. 50', N. lat. 54°. It is a large city, and has ſome good buildings in it, particularly the cathedral, which is a Gothic pile, equal to any thing of the kind in England. It is the ſee of an archbiſhop, and ſends two members to parliament.

New YORK, one of the Britiſh colonies in North America, which comprehending the Jerſeys, that frequently have the ſame governor, is ſituated between 72° and 74° of W. long. and between 41° and 44° of N. lat. bounded by Canada on the north, New England on the eaſt, the American Sea on the ſouth, and Penſilvania and the country of the Iroquois on the weſt.

New YORK, the capital city of this province, is ſituated on an iſland in the mouth of Hudſon's river, in W. lon. 72° 30', N. lat. 41°.

YUCCA, in botany, a genus of the hexandria monogynia claſs. The corolla is open and bell-ſhaped; it has no ſtylus; and the capſule has three cells. There are four ſpecies, all natives of America.

A kind of bread is made from the dried root of this plant by the Indians, which much reſembles that made from the root of the caſſida or ſcutellaria of Linnæus.

Z.

Z A M

ZAARA, one of the diviſions of Africa, ſituated under the tropic of cancer, is bounded by Bildulgerid on the north, by the unknown parts of Africa on the eaſt, by Nigritia or Negroland on the ſouth, and by the Atlantic ocean on the weſt. This is a barren deſart and ſo deſtitute of water, that the camels which paſs over it from Morocco to traffic with Negroland, are half loaded with water and proviſions.

ZAFFER, or ZAFRE, in chemiſtry, the name of a blue ſubſtance, of the hardneſs and form of a ſtone; and generally ſuppoſed to be a native foſſil.

It is in reality, however, a preparation of cobalt; the calx of that mineral being mixed with powdered flints and wetted with water to bring it into this form.

ZAMORA, a city of Spain in the province of Leon, ſituated on the river Douro, thirty-two miles north of Salamanca: W long. 6°, N. lat. 41° 30'.

Z A N

ZANGUEBAR, a country on the eaſt coaſt of Africa, ſituated in ſouthern latitude between the equator and the tropic of capricorn, being bounded by the country of Anian on the north, by the Indian ocean on the weſt, by Caffraria on the ſouth, and by the unknown parts of Africa on the weſt.

ZANNICHELLIA, in botany, a genus of the monœcia monandria claſs. The male has neither calix nor corolla. The calix of the female conſiſts of one leaf; it has no corolla; and there are four germina, and as many ſeeds. There is but one ſpecies, *viz.* the paluſtris, or horned pond-weed, a native of Britain

ZANONIA, in botany, a genus of the dioecia pentandria claſs. The calix of both male and female conſiſts of three leaves, and the corolla of five ſegments; the female has three ſtyli; and the berry contains two ſeeds. There is but one ſpecies, a native of Malabar.

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ZANTE, an iſland in the Mediterranean ſea, ſituated E. long. 21° 30′, N lat. 27° 50′, being about twenty four miles long, and twelve broad. The chief town is Zant, and is ſituated on the eaſt ſide of the iſland, being well fortified and defended by a caſtle.

ZAPATA, a kind of feaſt or ceremony held in Italy, in the courts of certain princes, on St Nicholas's day; wherein people hide preſents in the ſhoes or ſlippers of thoſe they would do honour to, in ſuch a manner as may ſurpriſe them on the morrow when they come to dreſs; being done in imitation of the practice of St Nicholas, who uſed in the night-time to throw purſes of money in at the windows, to marry poor maids withal.

ZARA, a city of Dalmatia, ſituated on the gulph of Venice: E. long. 17°, N. lat. 44°.

ZARNAW, a city of Poland, in the province of Little Poland and palatinate of Sandomir, ſituated E. long. 20°, N. lat. 51° 30′.

ZEA, INDIAN CORN, in botany, a genus of the monoecia triandria claſs The calix of the male is a double flowered glume, without any awn; the corolla is likewiſe a glume, without any awn; the calix and corolla of the male conſiſts each of two valves; the ſtylus is filiform, and pendulous; and the ſeeds are ſolitary, being ſunk in an oblong receptacle. There is but one ſpecies, a native of America.

ZEAL, the exerciſe of a warm animated affection, or paſſion, for any thing.

ZEALAND the chief of the Daniſh iſlands, is ſituated at the entrance of the Baltic-ſea, bounded by the Schaggerrac-ſea on the north; by the Sound, which ſeparates it from Schonen, on the eaſt; by the Baltic-ſea, on the ſouth; and by the ſtrait called the Great Belt, which ſeparates it from the iſland of Funen, on the weſt; being of a round figure near two hundred miles in circumference: the chief town is Copenhagen.

ZEALAND, is alſo a province of the United Netherlands, conſiſting of eight iſlands, which lie in the mouth of the river Scheld, bounded by the province of Holland, from which they are ſeparated by a narrow channel, on the north; by Brabant, on the eaſt; by Flanders, from which they are ſeparated by one of the branches of the Scheld, on the ſouth; and by the German ocean, on the weſt.

ZEALOTS, an ancient ſect of the Jews, ſo called from their pretended zeal for God's law, and the honour of religion.

ZEBRA, in zoology See EQUUS.

ZECHARIAH, a canonical book of the Old Teſtament, containing the predictions of Zechariah, the ſon of Barachia, and grandſon of Iddo. He is the eleventh of the twelve leſſer prophets. Zechariah entered upon the prophetic office at the ſame time with Haggai, and was ſent to the Jews upon the ſame meſſage, to reprove them for their backwardneſs in erecting the temple, and reſtoring divine worſhip; but eſpecially for the diſorder of their lives and manners, which could not but derive a curſe upon them. By ſeveral notable viſions and types, he endeavours to confirm their faith, and eſtabliſh their aſſurance concerning God's providence with them, and care over them; and as a proof and demonſtration of this, he interſperſes the moſt comfortable promiſes of the coming of the kingdom, the temple, the prieſthood, the victory, the glory of Chriſt the Branch. Nor does he forget to aſſure them of the ruin of Babylon, their moſt implacable enemy. This prophet is the longeſt and moſt obſcure of all the leſſer prophets, his ſtyle being interrupted and without connection.

ZEDOARY, in the materia medica, a root, the ſeveral pieces of which differ ſo much from one another in ſhape, that they have been divided into two kinds, as if two different things, under the names of the long and round zedoary, being only the ſeveral parts of the ſame root.

Zedoary is to be choſen freſh, ſound, and hard, in large pieces; it matters not as to ſhape, whether long or round; of a ſmooth ſurface, and of a ſort of fatty appearance within, too hard to be bitten by the teeth, and of the briſkeſt ſmell that may be; ſuch as is friable, duſty, and worm eaten, is to be rejected.

Zedoary, both of the long and round kind, is brought us from China; and we find by the Arabians, that they alſo had it from the ſame place. The round tubera are leſs frequent than the long, and ſome of them have therefore ſuppoſed them the produce of a different and more rare plant; but this is not ſo probable as that the general form of the root is long, and the round tubera are only luſus naturæ, and leſs frequent in it.

Zedoary, diſtilled with common water, affords a thick and denſe eſſential oil, which ſoon concretes of itſelf into a kind of camphor, and on this oil its virtues principally depend. It is a ſudorific, and is much recommended by ſome in fevers, eſpecially of the malignant kinds. It is alſo given with ſucceſs as an expectorant in all diſorders of the breaſt, ariſing from a tough phlegm, which it powerfully incides and attenuates; it is alſo good againſt flatulences, and in the cholic; it ſtrengthens the ſtomach, and aſſiſts digeſtion; and, finally, is given with ſucceſs in nervous caſes of all kinds.

ZELL, a city of Germany, in the circle of Lower Saxony, capital of the duchies of Zell and Lunenburg, ſituated at the confluence of the rivers Aller and Fuhſe, thirty miles north of Hanover, and forty ſouth of Lunenburg: E. long. 10°, N. lat 52° 52′.

ZEND, or ZENDAVESTA. a book containing the religion of the Magians, or worſhippers of fire, who were diſciples of the famous Zoroaſter. See MAGI.

This book was compoſed by Zoroaſter during his retirement in a cave, and contained all the pretended revelations of that impoſtor. The firſt part contains the liturgy of the magi, which is uſed among them in all their oratories and fire-temples to this day; they reverence it as the Chriſtians do the Bible, and the Mahometans the Koran. There are found many things in the zend taken out of the ſcriptures of the Old Teſtament, which Dr. Prideaux thinks is an argument that Zoroaſter was originally a Jew. Great part of the Pſalms of David are inſerted: he makes Adam and Eve to have been the firſt parents of mankind, and gives the ſame hiſtory of the creation and deluge as Moſes does, and commands the ſame obſervances about clean and unclean beaſts, the ſame law of paying tythes to the ſacerdotal order, with many other inſtitutions of Jewiſh extraction. The reſt of its contents are an hiſtorical account of the life, actions, and prophecies of its author, with rules and exhortations to moral living. The Mahometans have a ſect which they call Zendikites, who are ſaid to be the Sadducees of Mahometaniſm, denying providence and the reſurrection, believing

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lieving the tranſmigration of ſouls, and following the zend of the magi.

ZENITH, in aſtronomy, the vertical point; or a point in the heavens directly over our heads.

ZEPHANIAH, a canonical book of the Old Teſtament, containing the predictions of Zephaniah the ſon of Cuſhi, and grandſon of Gedaliah; being the ninth of the twelve leſſer prophets. He propheſied in the time of king Joſiah, a little after the captivity of the ten tribes, and before that of Judah; ſo that he was co-temporary with Jeremiah. He freely publiſhes to the Jews, that what increaſed the divine wrath againſt them, was their contempt of God's ſervice, their apoſtacy, their treachery, their idolatry, their violence and rapine, and other enormities: ſuch high provocations as theſe rendered their deſtruction terrible, univerſal, and unavoidable: and then, as moſt of the prophets do, he mingles exhortations with repentance, as the only expedient in theſe circumſtances.

ZEPHYR, the weſt wind, or that which blows from the cardinal point of the horizon oppoſite to the eaſt.

ZEST, the woody thick ſkin, quartering the kernel of a walnut; preſcribed by ſome phyſicians, when dried and taken with white-wine, as a remedy againſt the gravel.

ZETETIC METHOD, in mathematics, the method made uſe of to inveſtigate or ſolve a problem.

ZEUGMA, a figure in grammar, whereby an adjective or verb which agrees with a nearer word, is alſo, by way of ſupplement, referred to another more remote.

ZEUS, in ichthyology, a genus belonging to the order of thoracici. The head is compreſſed, and declines, the upper lip being vaulted over by a tranſverſe membrane; the tongue is ſubulated; there are ſeven rays in the gill-membrane; and the body is compreſſed. The ſpecies are four, diſtinguiſhed by the ſhape of their tails.

ZEBETHICUS, in zoology. See CASTOR.

ZINGIBER, in botany. See AMOMUM.

ZINK. See CHEMISTRY, p. 90, 106, 143.

ZINZIBER, or ZINGIBER, GINGER, in botany, the naked ſtalked oval ſpiked amomum. See AMOMUM, and GINGER.

ZIRANIA, in botany a genus of the monoecia hexandria claſs The male has no calix; the corolla conſiſts of a double-valved glume, without any awn. The female has no calix; the corolla conſiſts of a ſingle-valved gluma with an awn; the ſtylus is bifid; and there is but one ſeed. The ſpecies are two, none of them natives of Britain.

ZIZIPHORA, in botany, a genus of the diandria monogynia claſs. The corolla is ringent, the ſuperior labium being reflected and entire; the calix is ſiliform; and there are four ſeeds. The ſpecies are four, none of them natives of Britain.

ZODIAC, in aſtronomy, a faſcia or broad circle, whoſe middle is the ecliptic, and its extremes two circles parallel thereto, at ſuch a diſtance from it as to bound or comprehend the excurſions of the ſun and planets. See ASTRONOMY.

ZOLLERN, a city of Germany, in the circle of Swabia, capital of the county of Zollern, and ſubject to its count: ſituated E. long. 8° 55′, N lat. 48° 18′.

ZONE, in geography and aſtronomy, a diviſion of the terraqueous globe, with reſpect to the different degrees of heat found in the different parts thereof. See GEOGRAPHY.

ZOOLOGY, the ſcience of animals. See NATURAL HISTORY.

ZOOPHIT, in natural hiſtory, a kind of intermediate body, partaking of the nature of a ſenſitive and a vegetable. See NATURAL HISTORY.

ZOOTOMY, the art of diſſecting animals or living creatures, being the ſame with anatomy. See ANATOMY.

ZUG, one of the cantons of Switzerland, is ſurrounded by the cantons of Lucern, Zurich, and Switz; and is eighteen miles long, and ſeven broad.

ZUINGLIANS, a branch of the ancient Chriſtian reformers, or proteſtants; ſo called from their author Huldric Zuinglius, a divine of Switzerland, who ſoon after Luther had declared againſt the church of Rome; and being then miniſter of the church at Zurich, fell in with him, and preached openly againſt indulgences, the maſs, the celibacy of the cergy, *&c.* What he differed from Luther in, concerned the euchariſt: for interpreting *hoc eſt corpus meum*, by *hoc ſignificat corpus meum*, he maintained that the bread and wine were only ſignifications of the body and blood of Jeſus Chriſt; whereas Luther held a conſubſtantiation.

ZURICH, a canton of Switzerland, bounded by the canton of Schaffhauſen on the north, by the canton of Appenzel on the eaſt, by Zug and Switz on the ſouth, and by Bern and Lucern on the weſt; being fifty miles long, and forty broad. Zurich is alſo the name of the capital city of this canton, ſituated E. long 8° 30′, and N. lat. 47° 52′. It is likewiſe the name of a lake, twenty-four miles long, and three broad; at the ſouth end of which the city of Zurich ſtands.

ZUTPHEN, a city of a county of the ſame name, in Gelderland, ſituated on the river Yſſel, ſixteen miles north-eaſt of Arnheim: E. long. 6°, N. lat. 52° 15′.

ZUYDERSEE, a great bay of the German ocean, which lies in the middle of the United provinces, having the iſlands of Texel, Flie, and Schelling, at the entrance of it, on the north; the provinces of Frieſland, Overyſſel, and Gelderland, on the eaſt; Utrecht, and part of Holland, on the ſouth; and another part of Holland on the weſt. The chief town is Amſterdam.

ZWEIBRUGGEN, a county of the palatinate of the Rhine, in Germany, ſubject to the duke of Deuxponts.

ZYGÆNA, in ichthyology. See SQALUS.

ZYGOMA, in anatomy. See ANATOMY, p. 152.

ZYGOMATICUS, in anatomy. See ANATOMY, p. 306.

ZYGOPHYLLUM, in botany, a genus of the decandria monogynia claſs. The corolla conſiſts of five leaves, and the corolla of five petals; the nectarium conſiſts of ten leaves, covering the germen; and the capſule has five cells. There are 8 ſpecies, none of them natives of Britain.

F I N I S.

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CORRIGENDA.

Page 132. col. 1. l. 25, 26. Read of *from the salivary glands, from smoking*, &c. read, *as to the salivary glands from smoking*, &c.

P. 510. col. 2. l. *ult.* For (*ibid.* n° 2.) read (*Plate CXLVII. fig.* 1. *n°* 1.)

METAPHYSICS, l. 10. For *metaphyfics*, read *phyfics*.

P. 588. col. 2. l. *ult.* Inſtead of *which is always really a diphthong*, read, *which is always, when long, really a diphthong*.

P. 590. col. 1. l. 41. For *curve line*, read *carvilineal*.

NOTANDA.

1. In the Table of ERRATA at the end of Vol. I. it was ſaid, "That Plate XLVII. repreſented a different Orrery from the one deſcribed." This was a miſtake the Printer was ſomehow led into: for the Orrery there repreſented is the right one, and correſponds with the deſcription.
2. In FLAX-DRESSING, plans of two machines relating to that article were referred to, but which ſeveral circumſtances now render it difficult for the Editors to give. It is therefore hoped theſe will be diſpenſed with, as they are not of the moſt general importance, and the article is ſufficiently explained and illuſtrated without them; and eſpecially as 10 plates more than the propoſed number, and 16 pages of letter-preſs, are given gratis.

DIRECTIONS to the BINDER.

1. Be careful in cutting the book, not to pare too much off the margin; as it was neceſſary, in ſeveral places, particularly in BOOK-KEEPING, to enlarge the page beyond the meaſure of the reſt of the book.
2. Title-pages for the Three Volumes are printed. Place them reſpectively at the beginning of the Volume; and after the title in Vol. I. inſert the Preface.
3. In BOOK-KEEPING, Vol. I. cancel pages 585, 586; and in their place inſert the leaves marked with an aſteriſk and incloſed with parentheſis, *viz.* (*585) (*586), (*A) (*A), (*B) (*B), (*C) (*C), (*D) (*D), (*E) (*E).
4. Inſert the Plates as directed below.

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